Comparing Isotopic Niche Size and Placement

Dr. Inga E. Conti-Jerpe

HKU Stable Isotope Ecology Post-Graduate Short Course

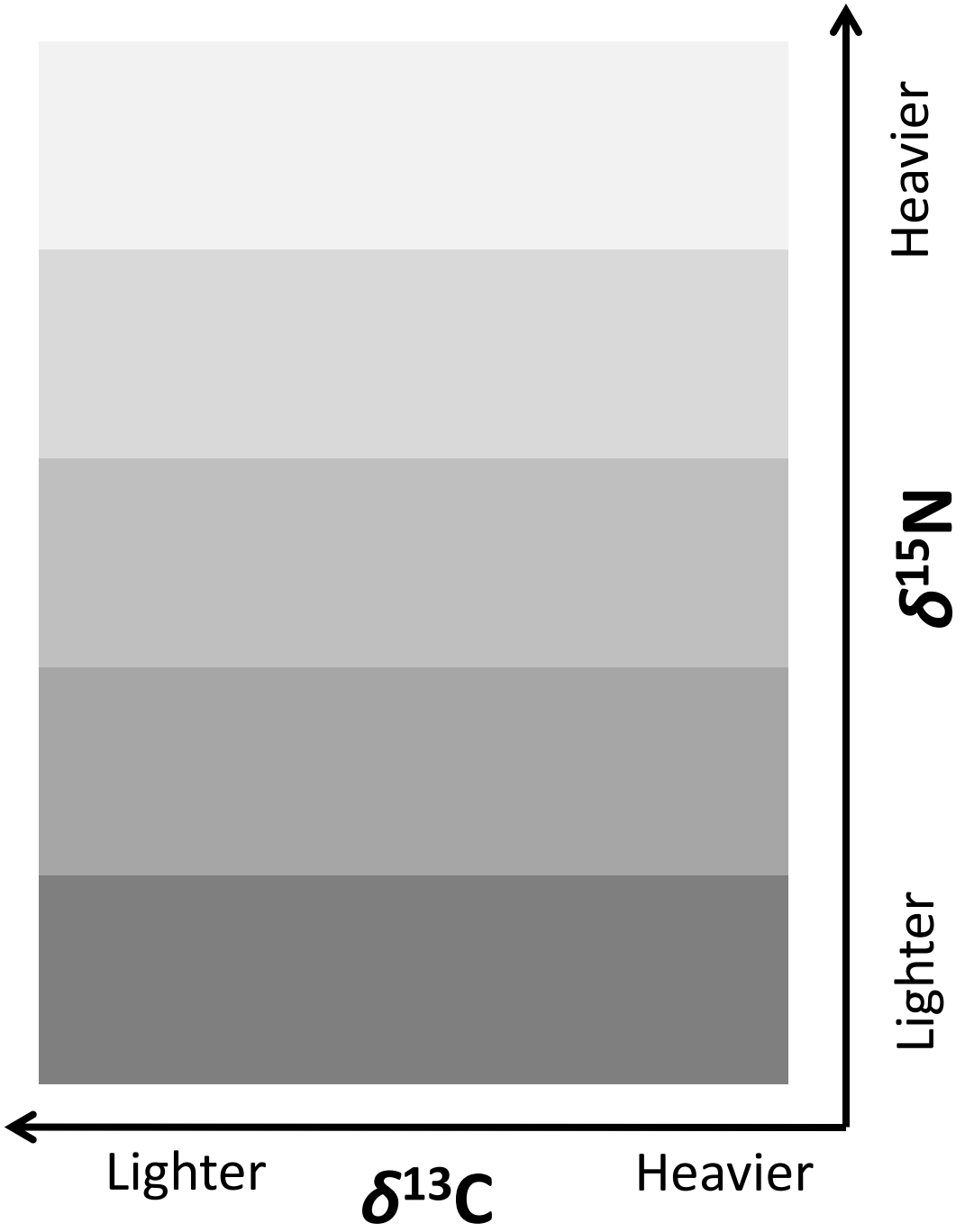
10 October 2019

Isotopic Niche

Trophic enrichment:

δ13C enrichment = 0-1‰

δ15N enrichment = 2.5-3.5‰



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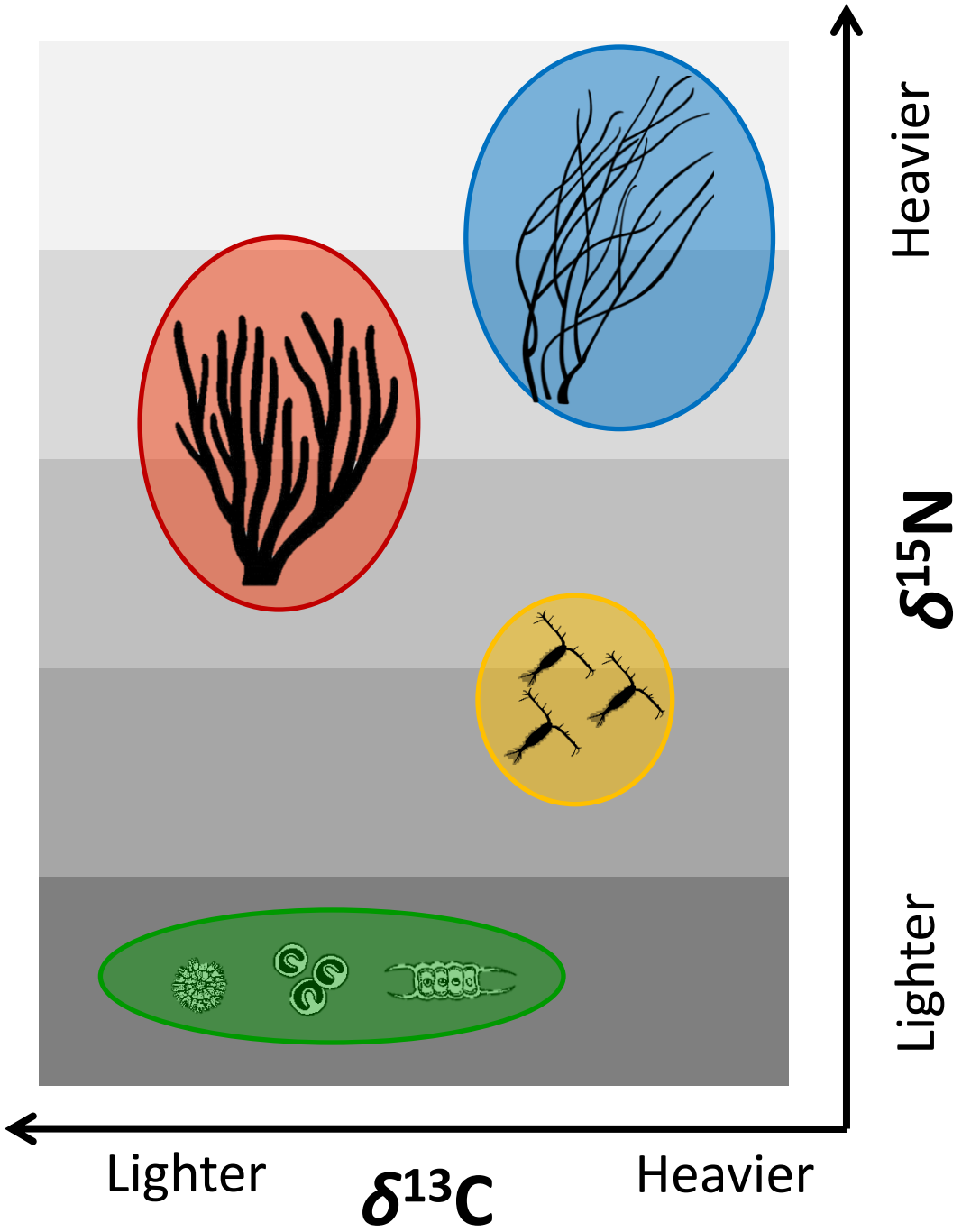

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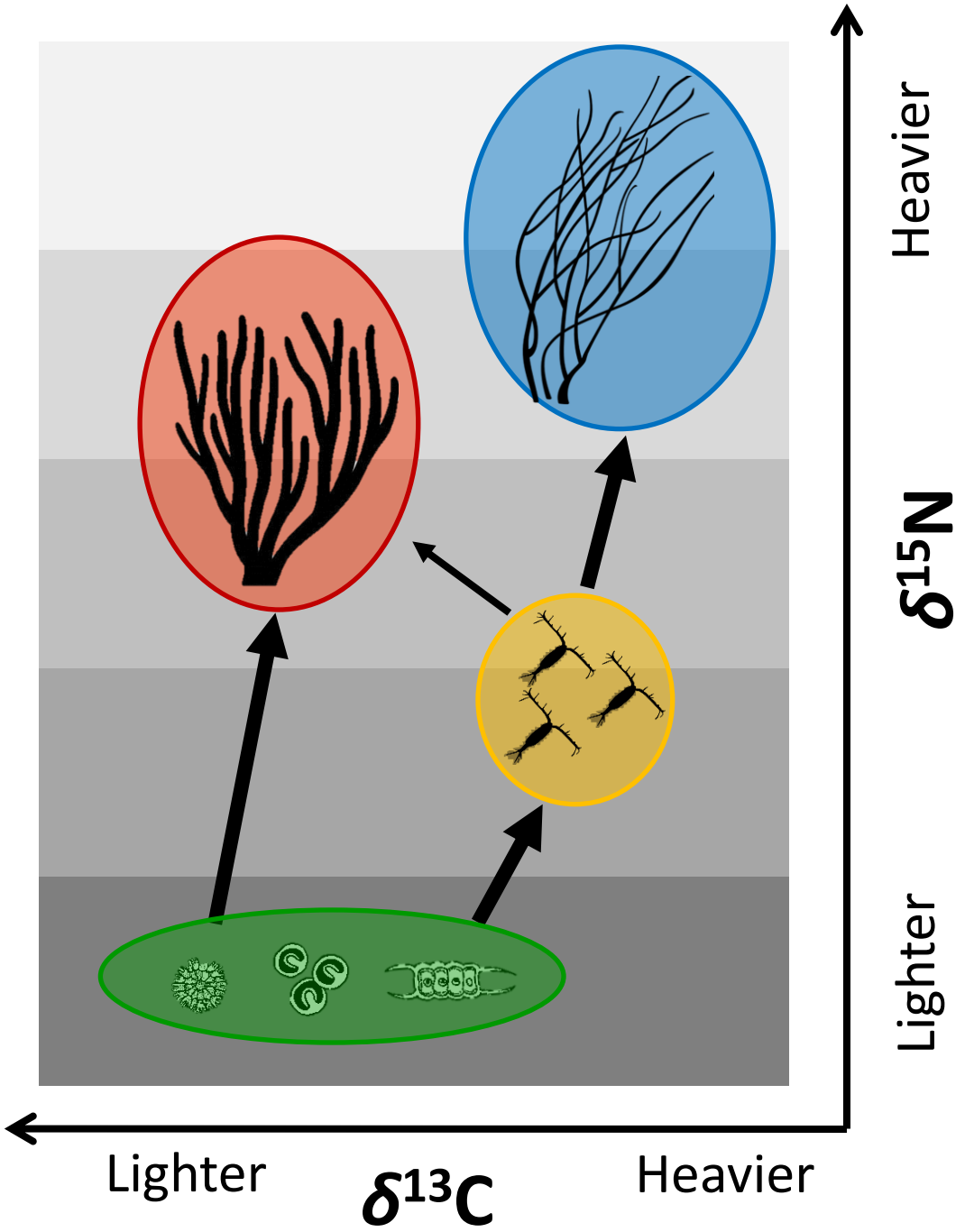

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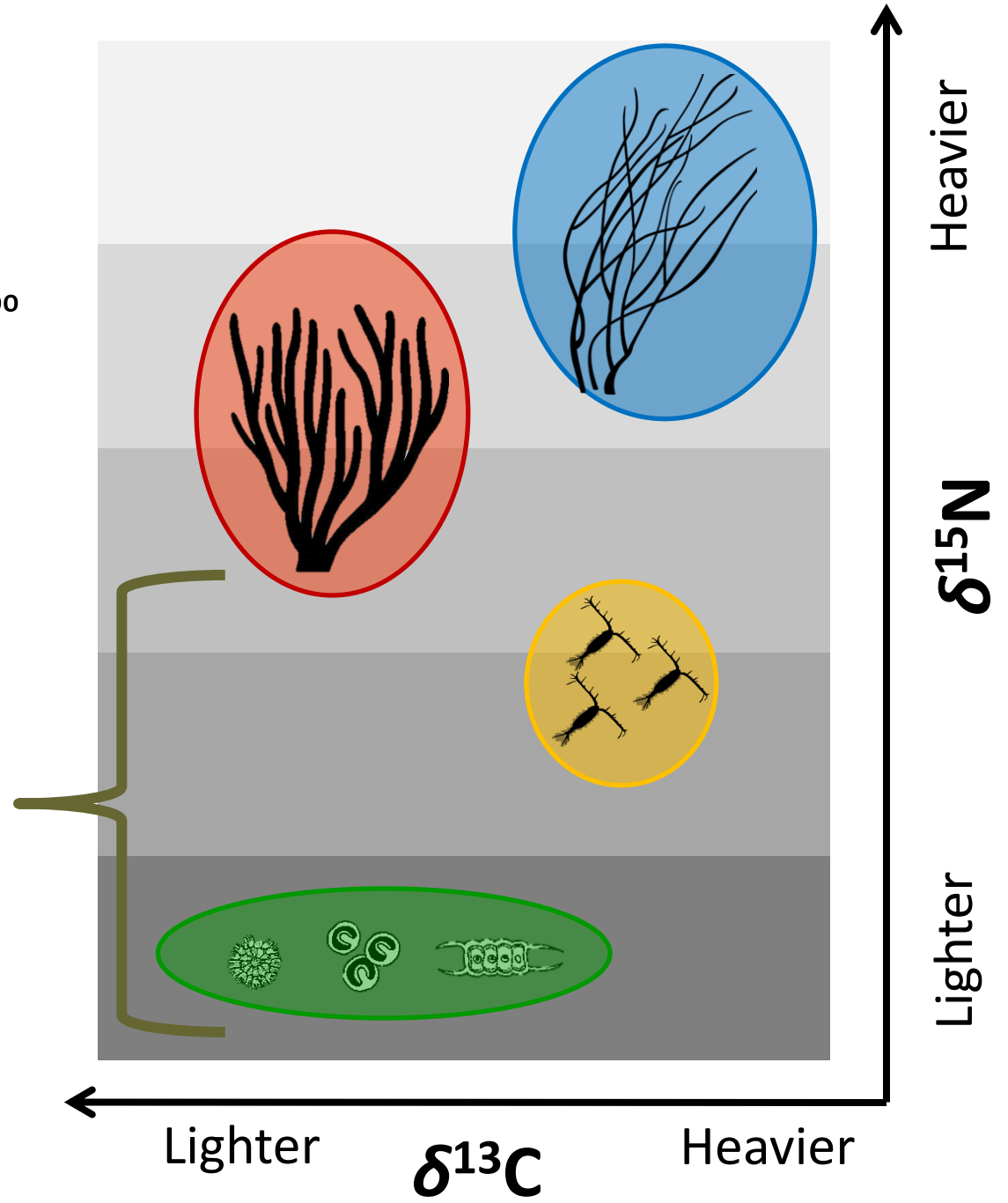

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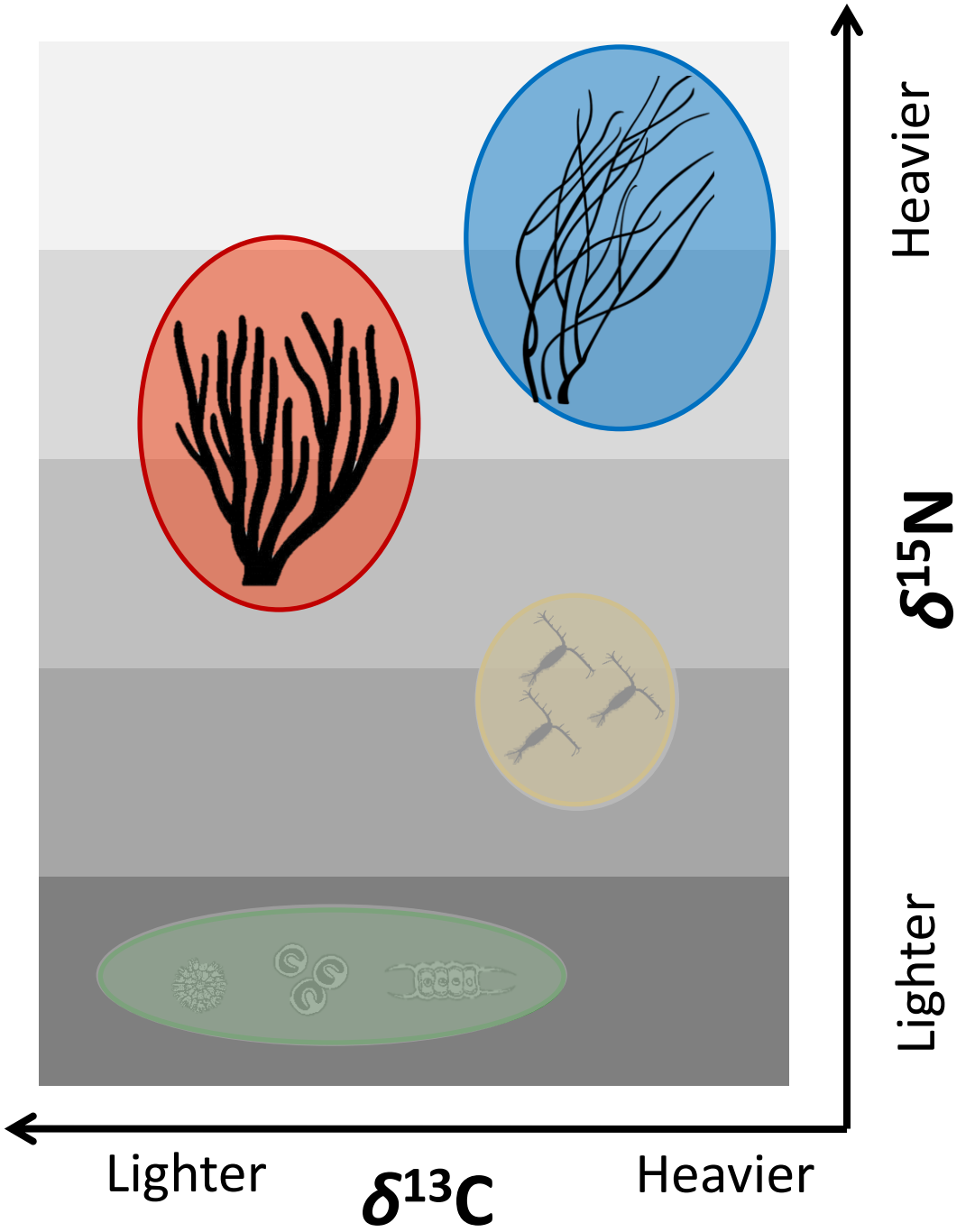

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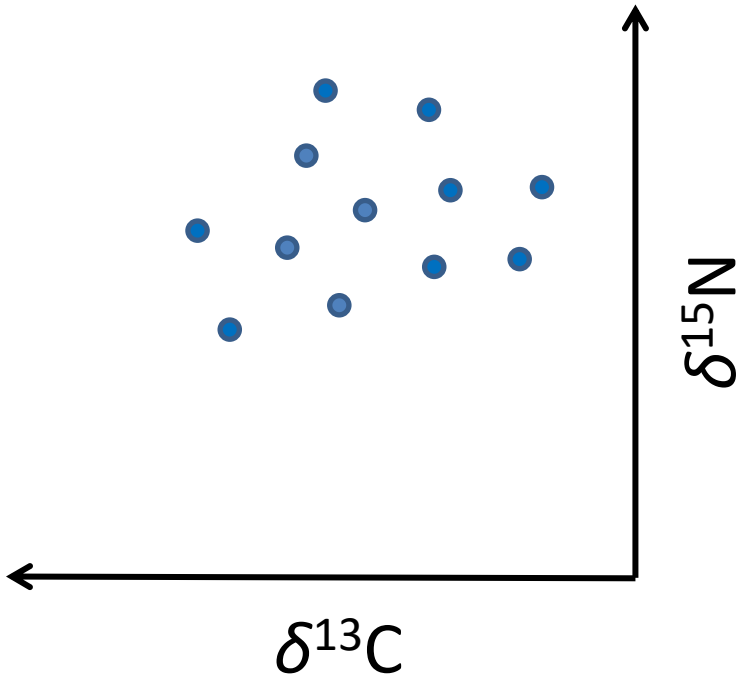

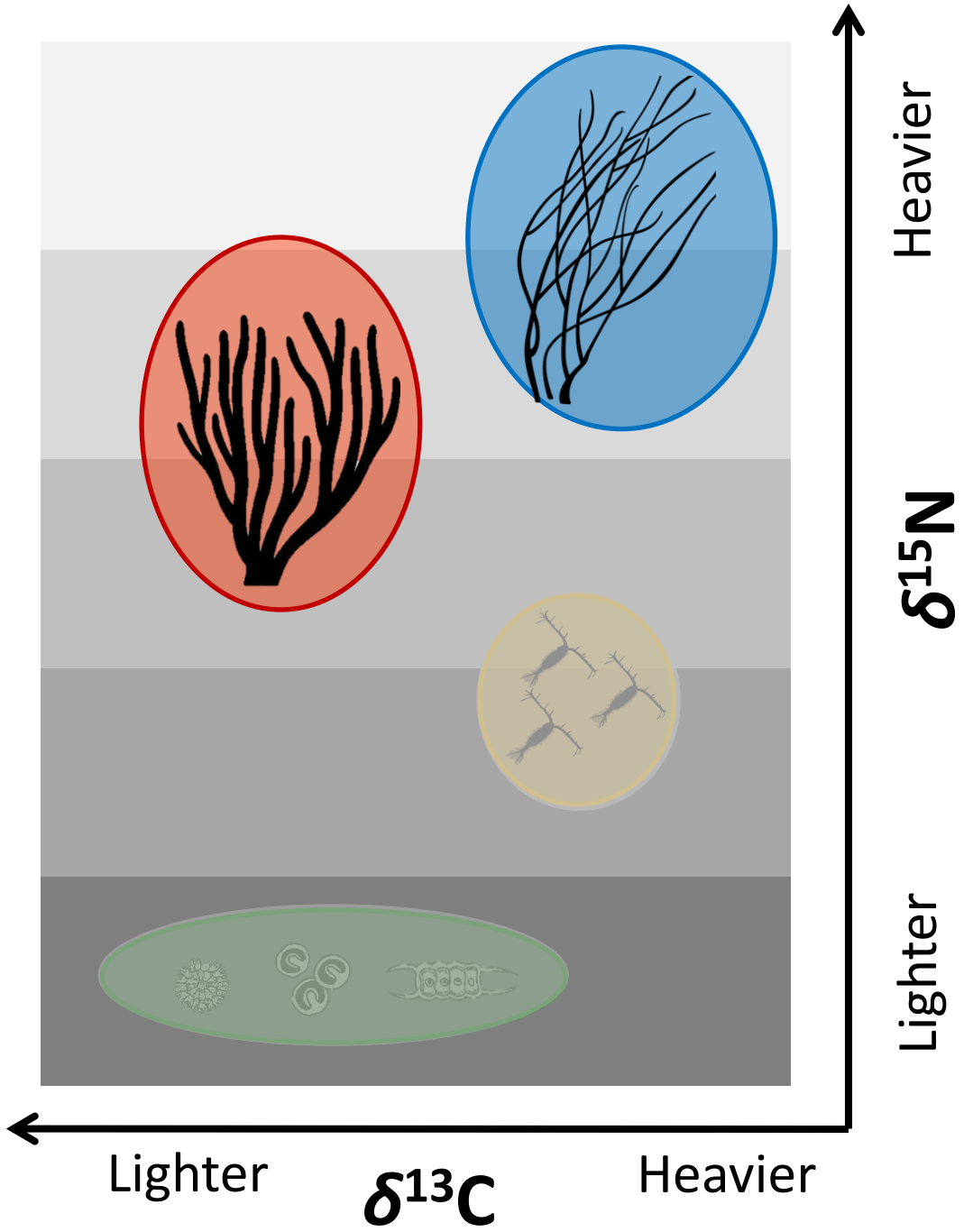

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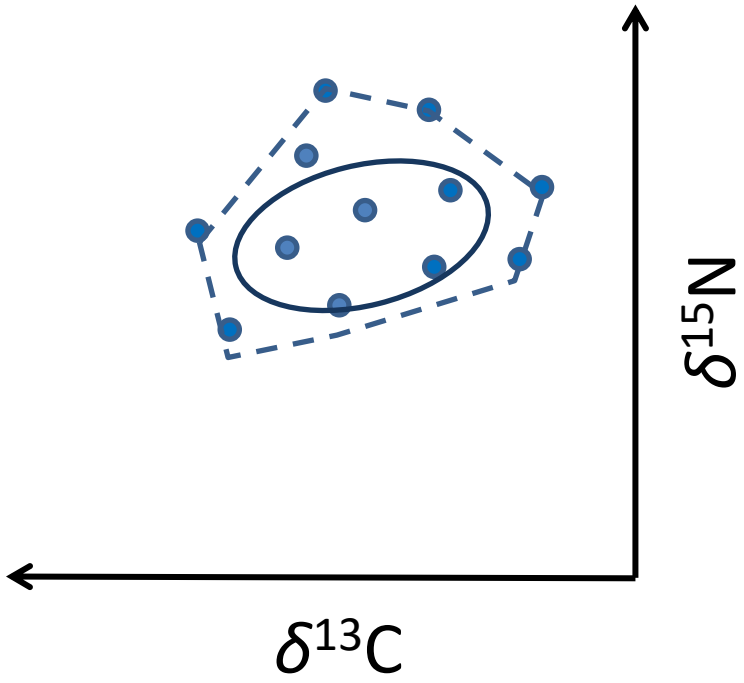
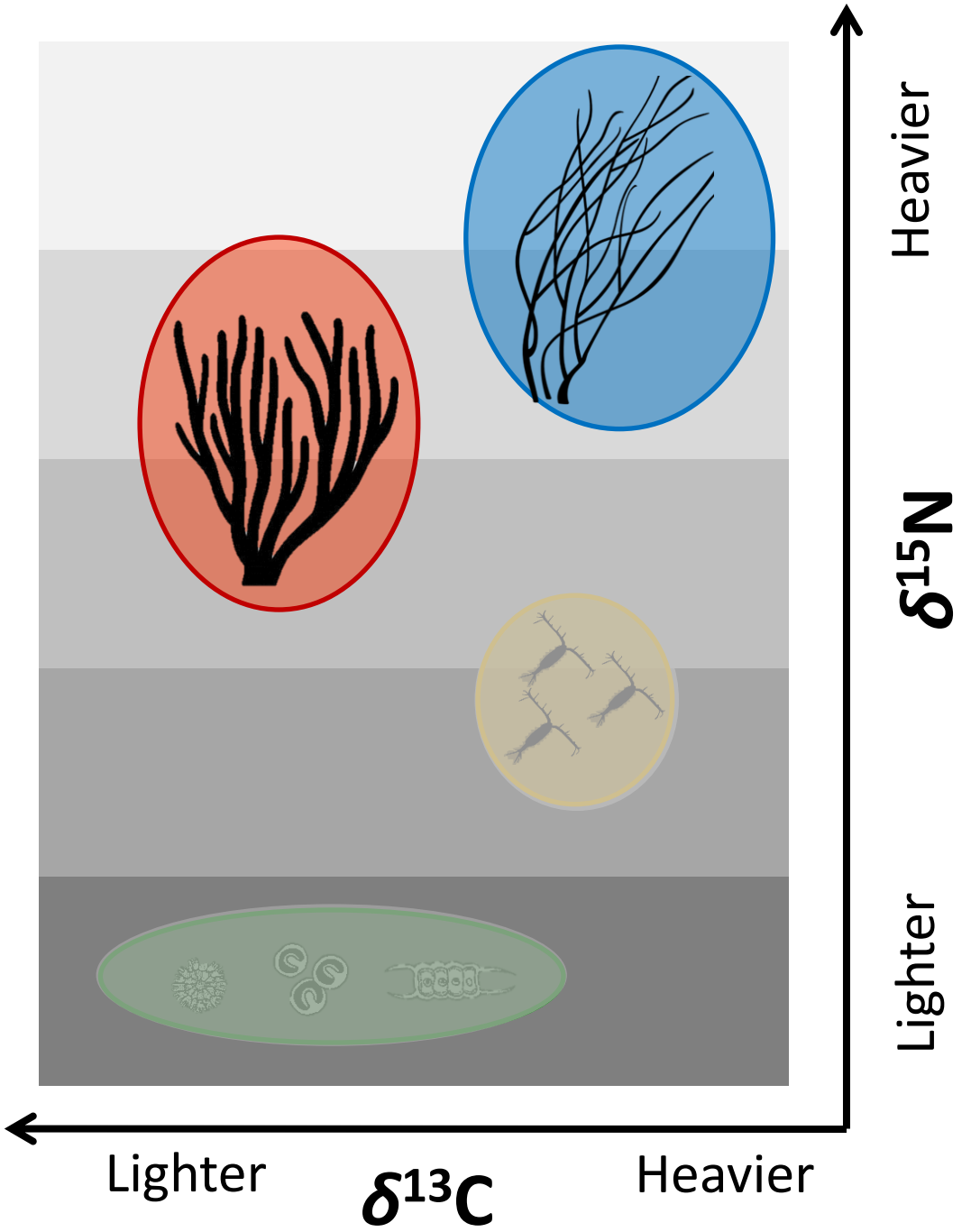
Isotopic niches ≈ trophic niche





Isotopic Niche

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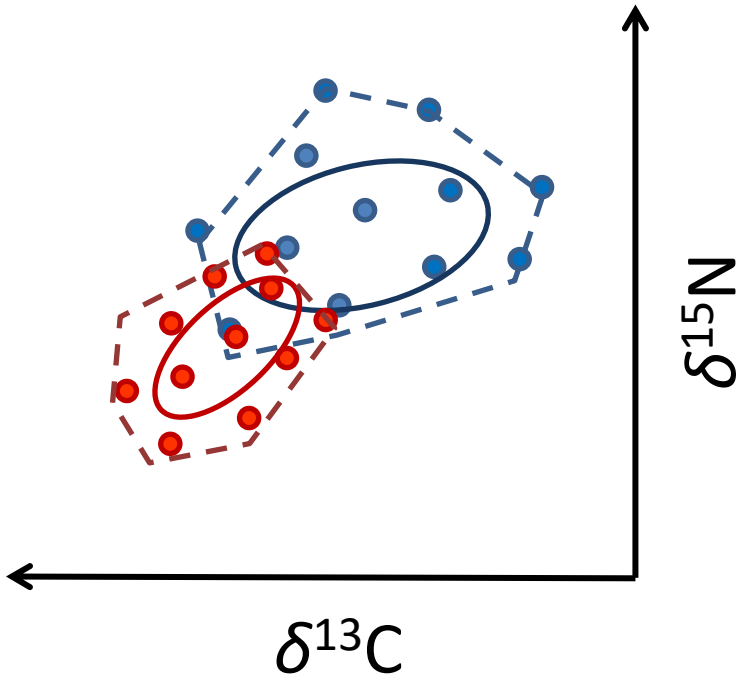
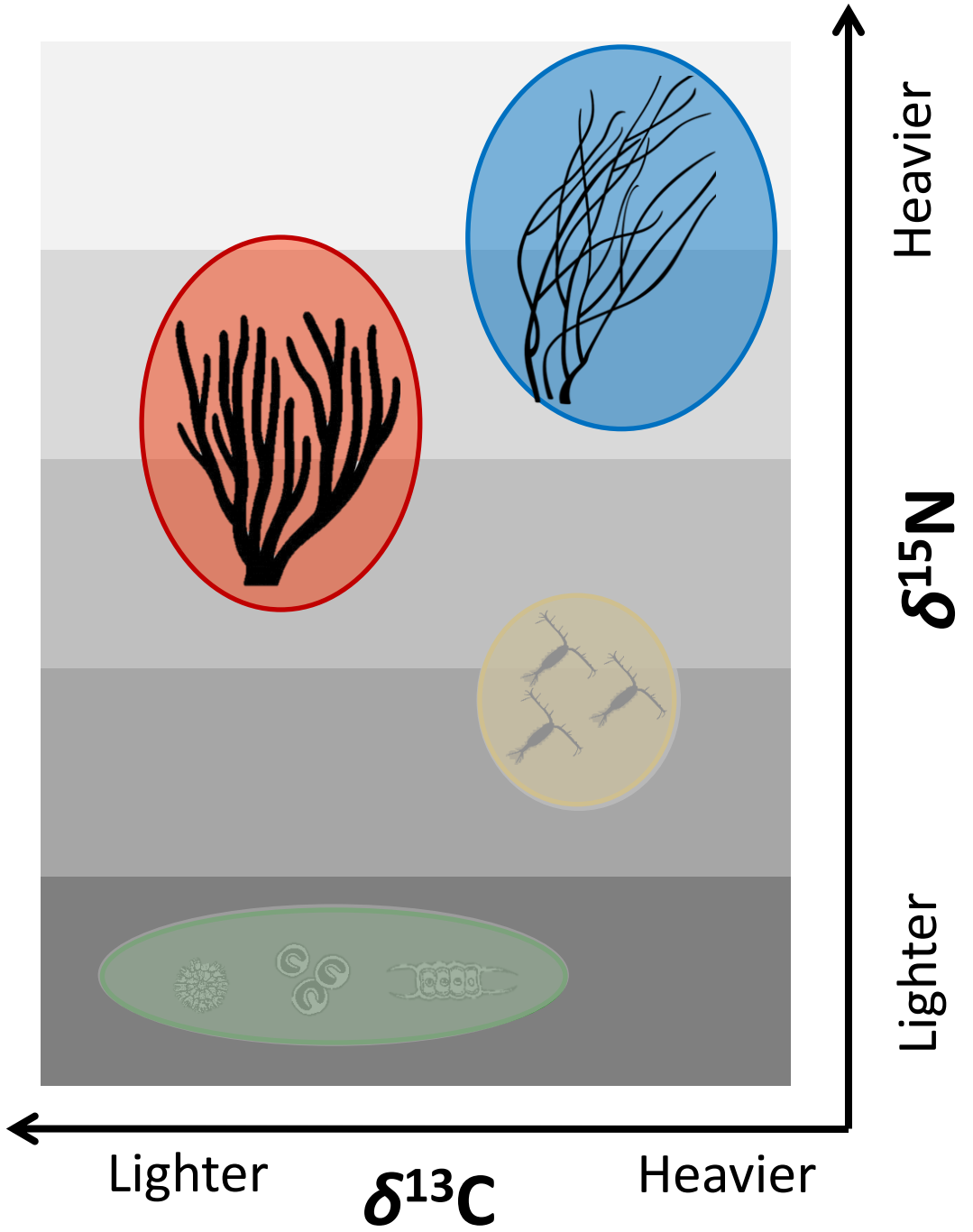
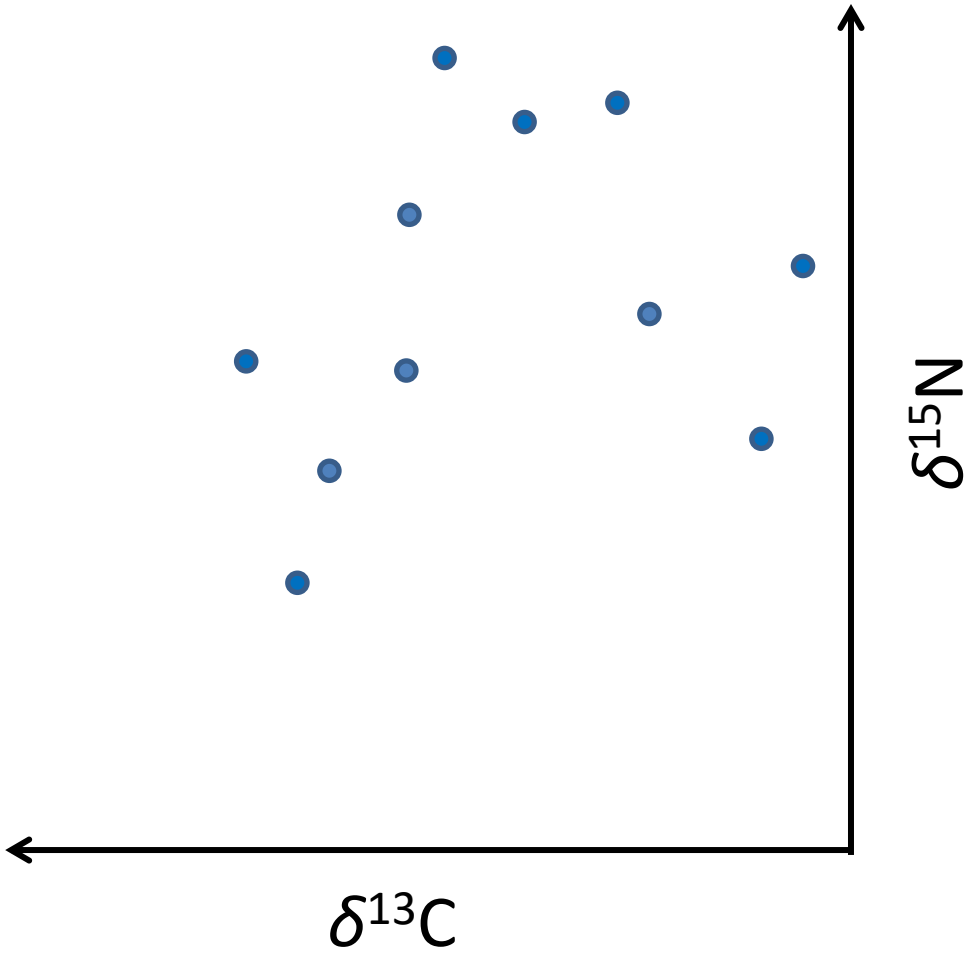
- **Placement**
- **Size**





"Old" School: Laymen Metrics

Laymen et al. 2007



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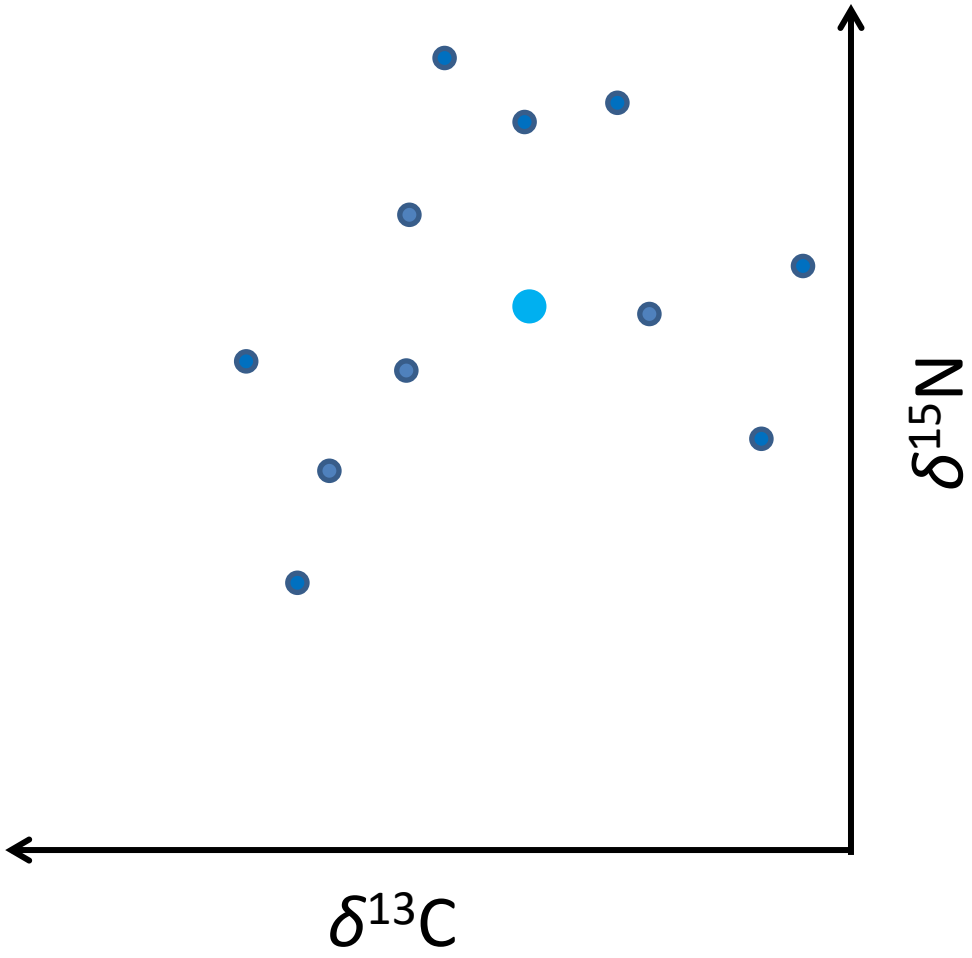

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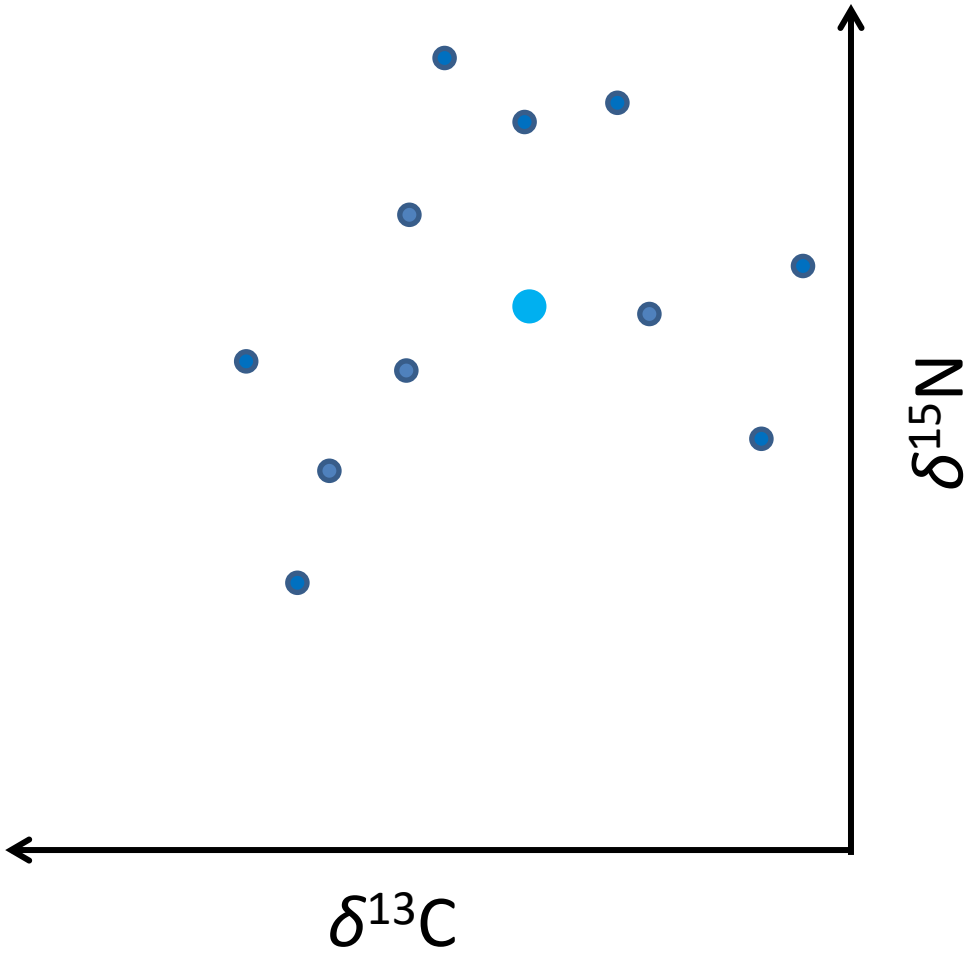

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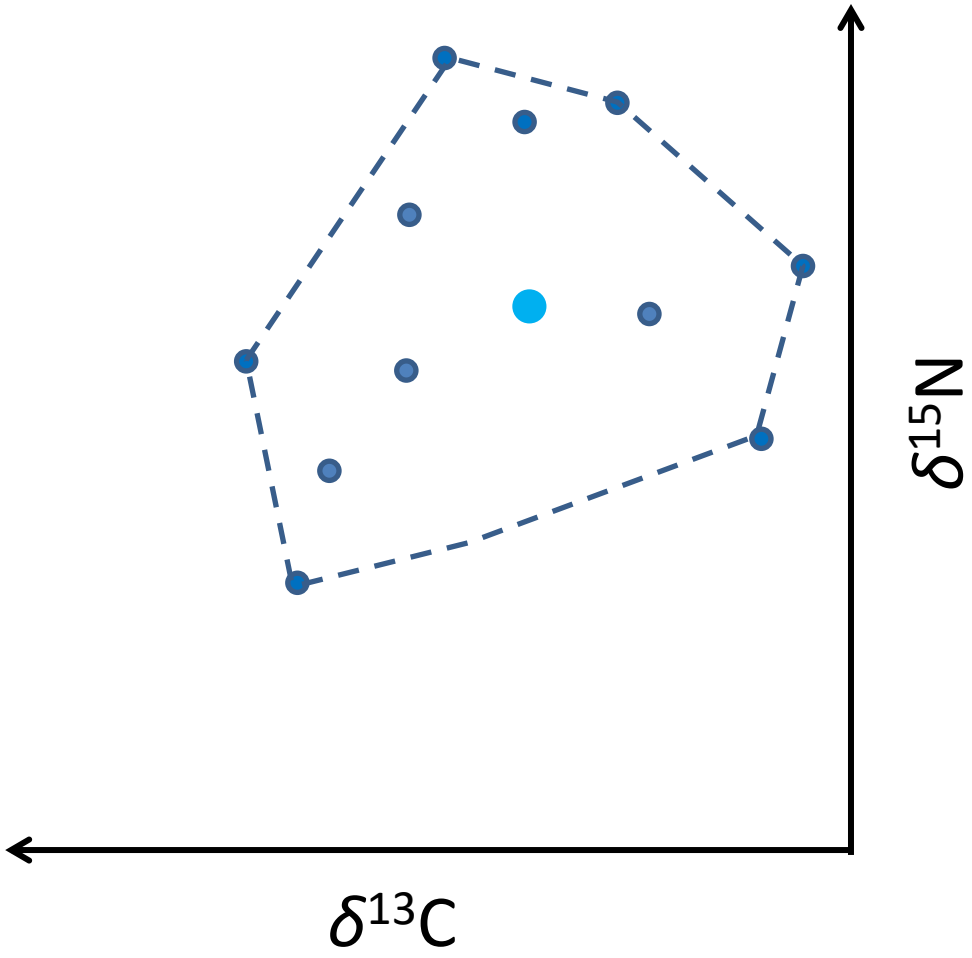

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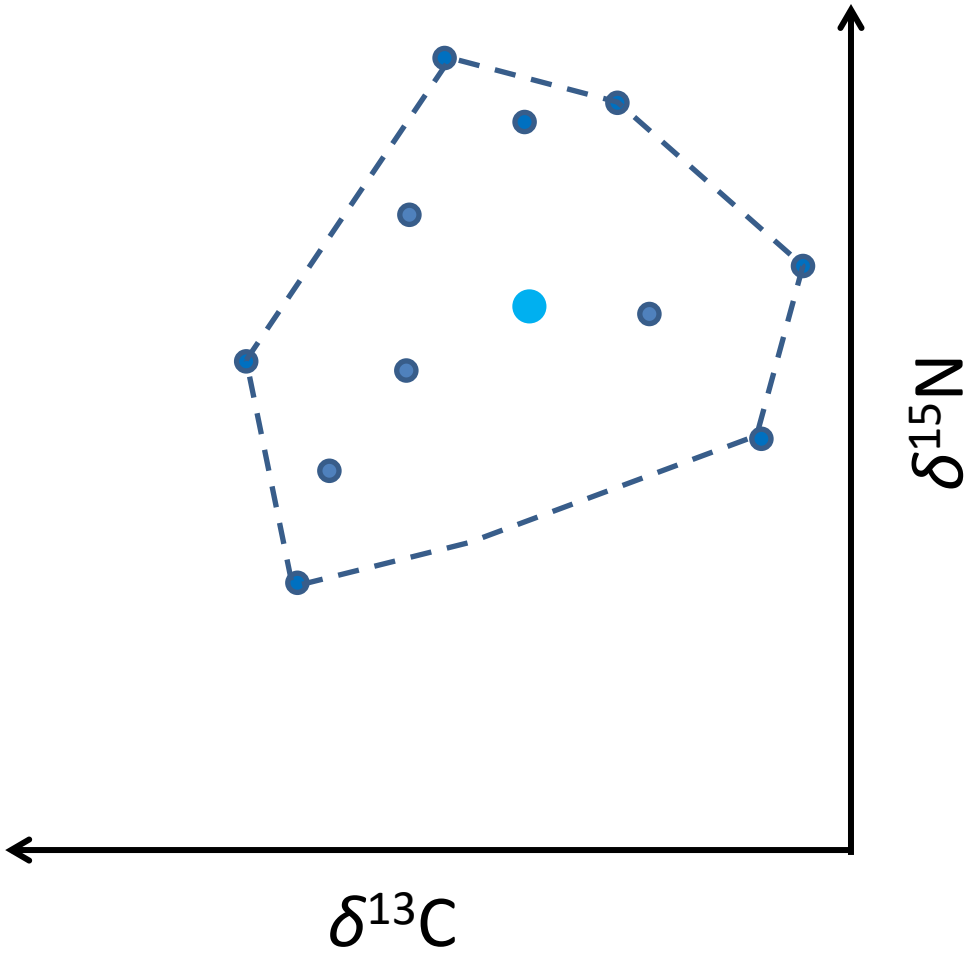

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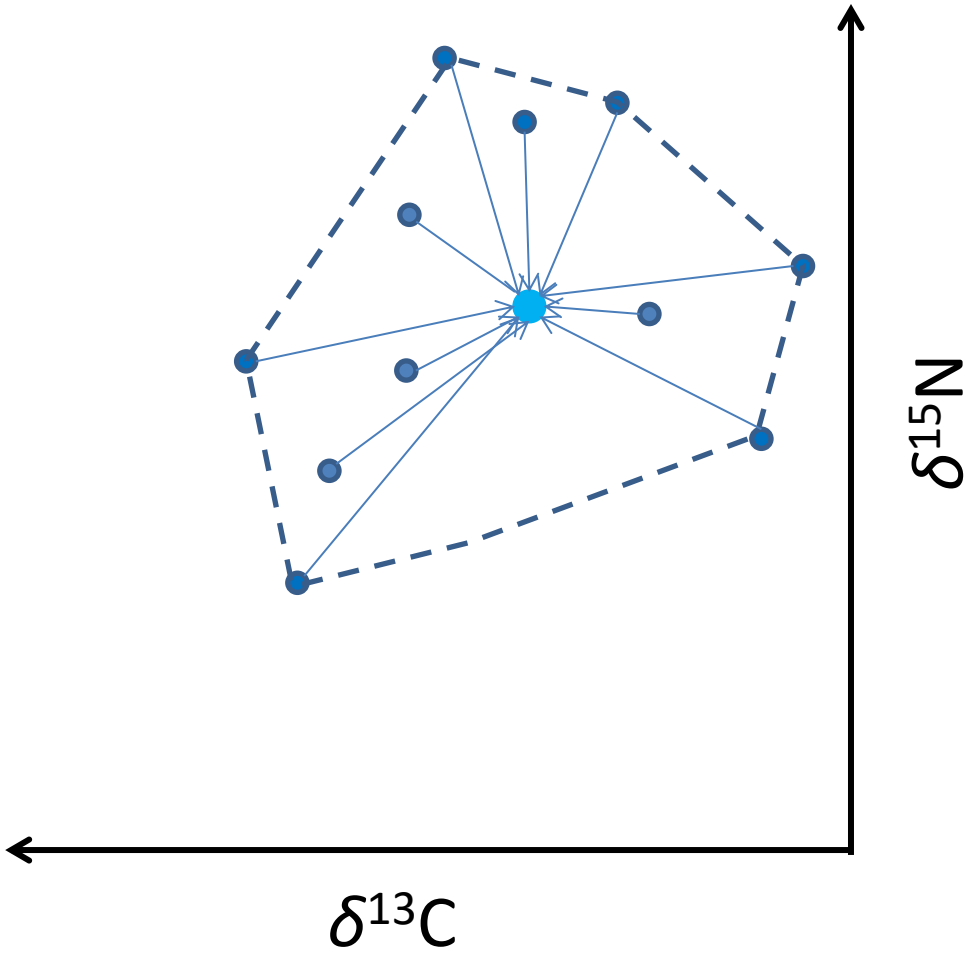

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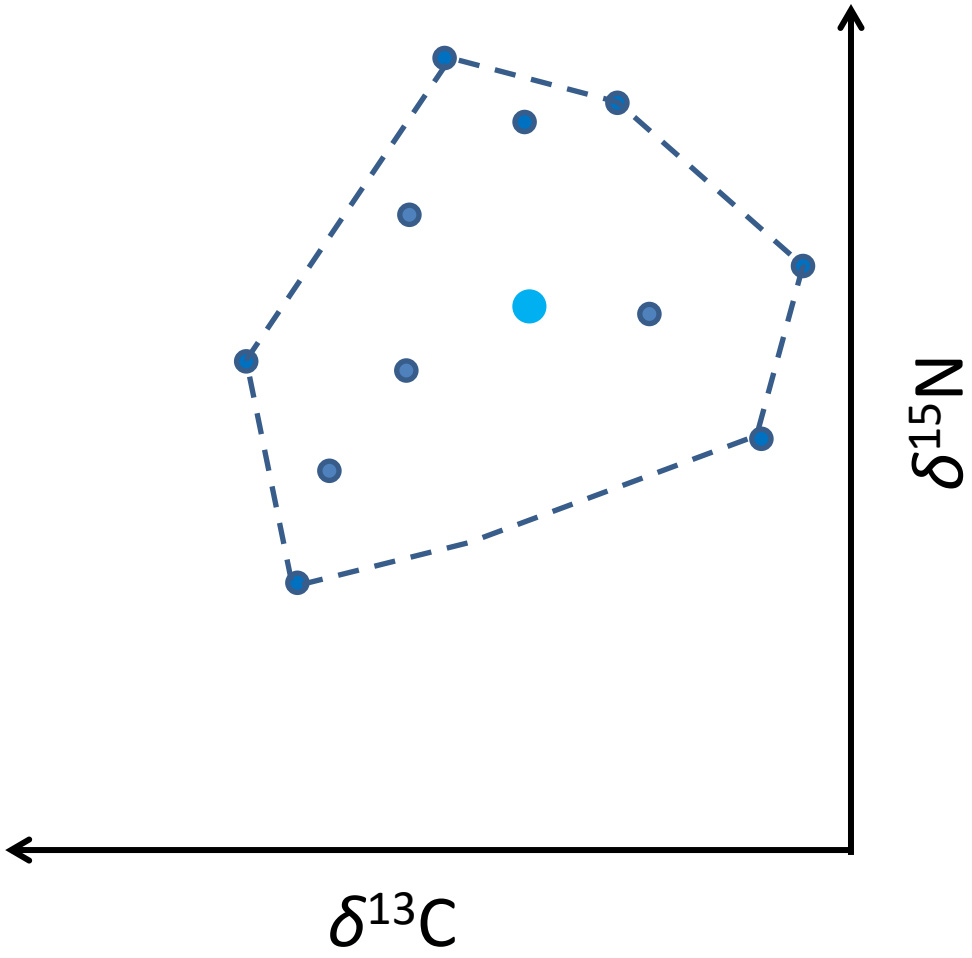

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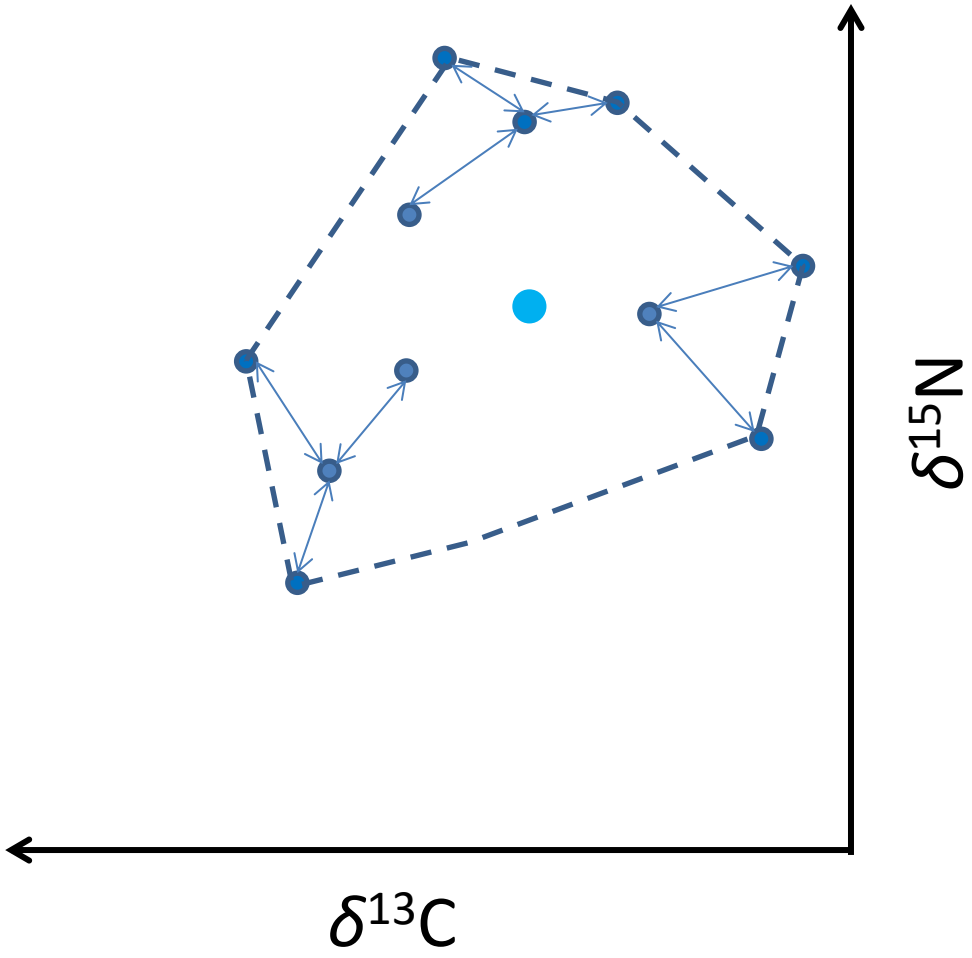

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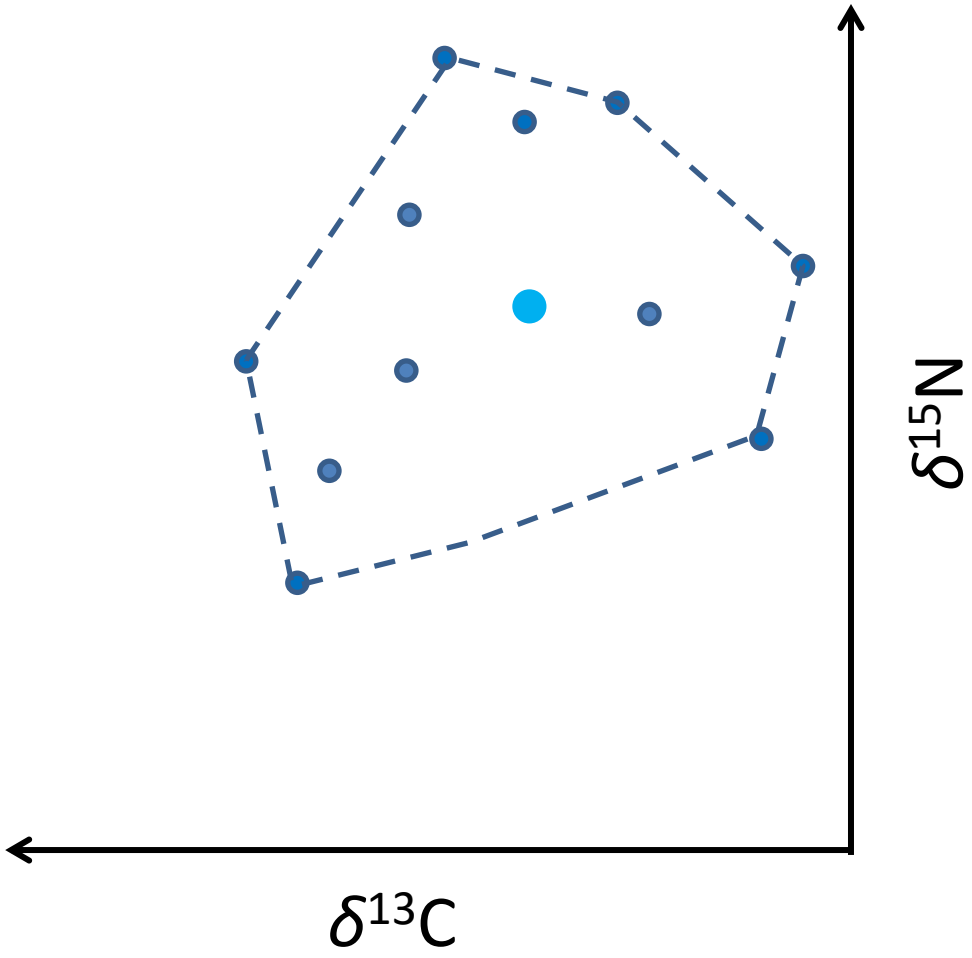

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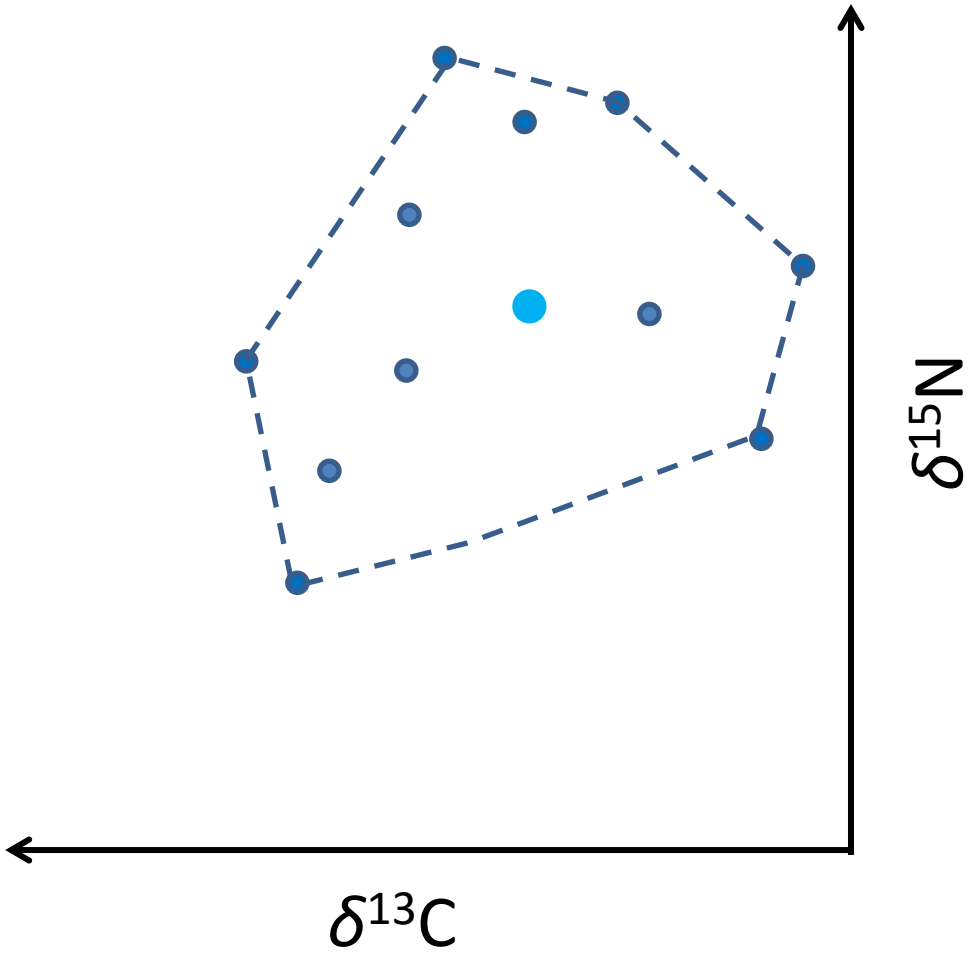

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  - 0 = perfectly circular
  - 1 = perfectly linear

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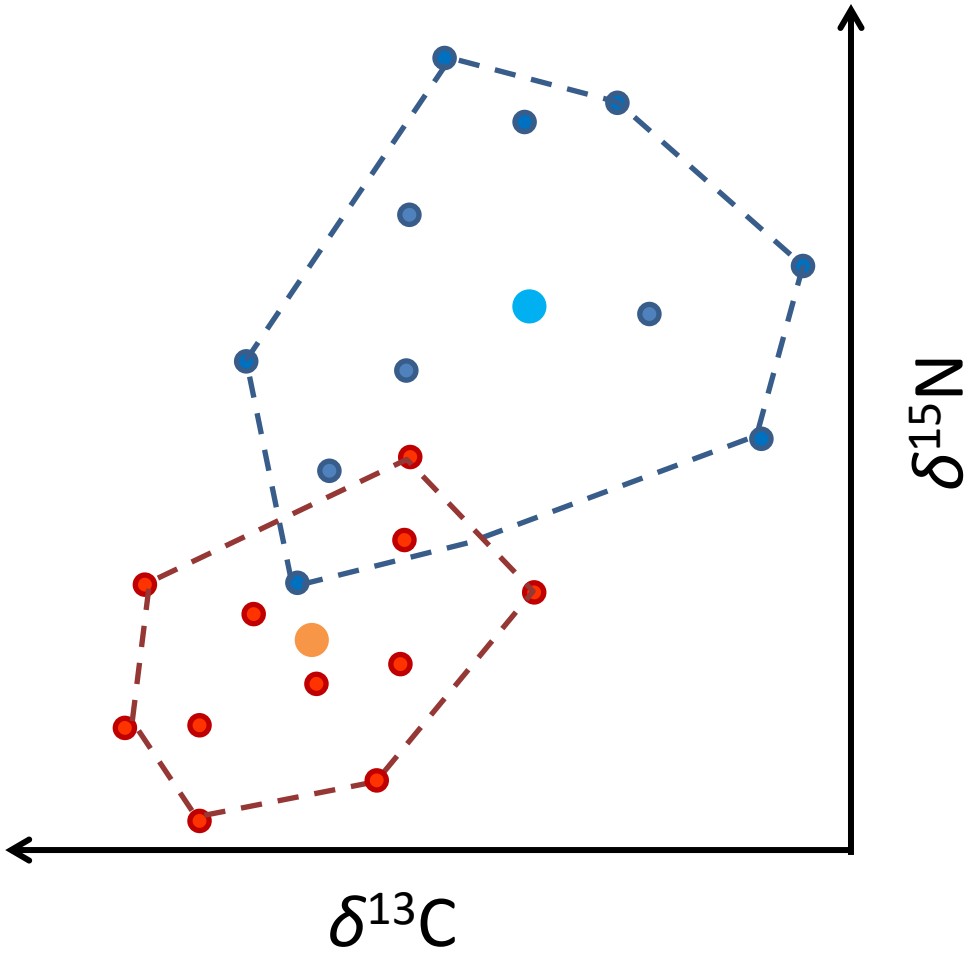

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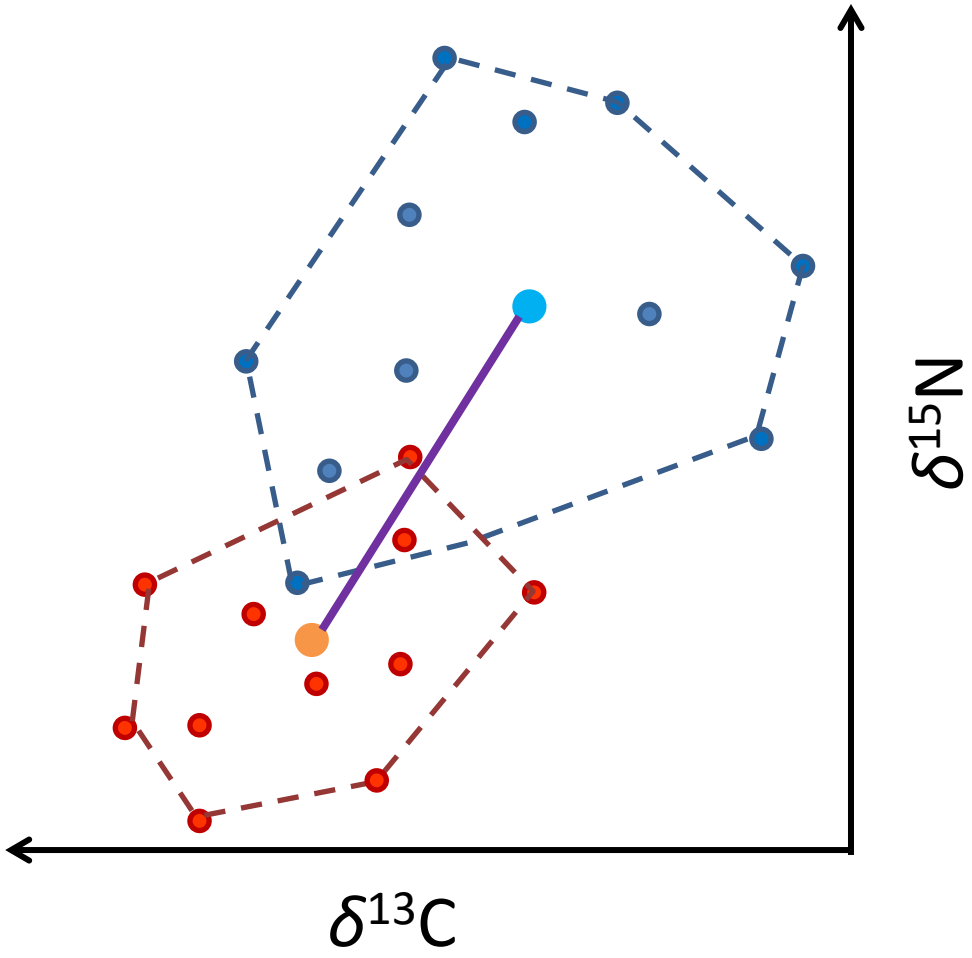

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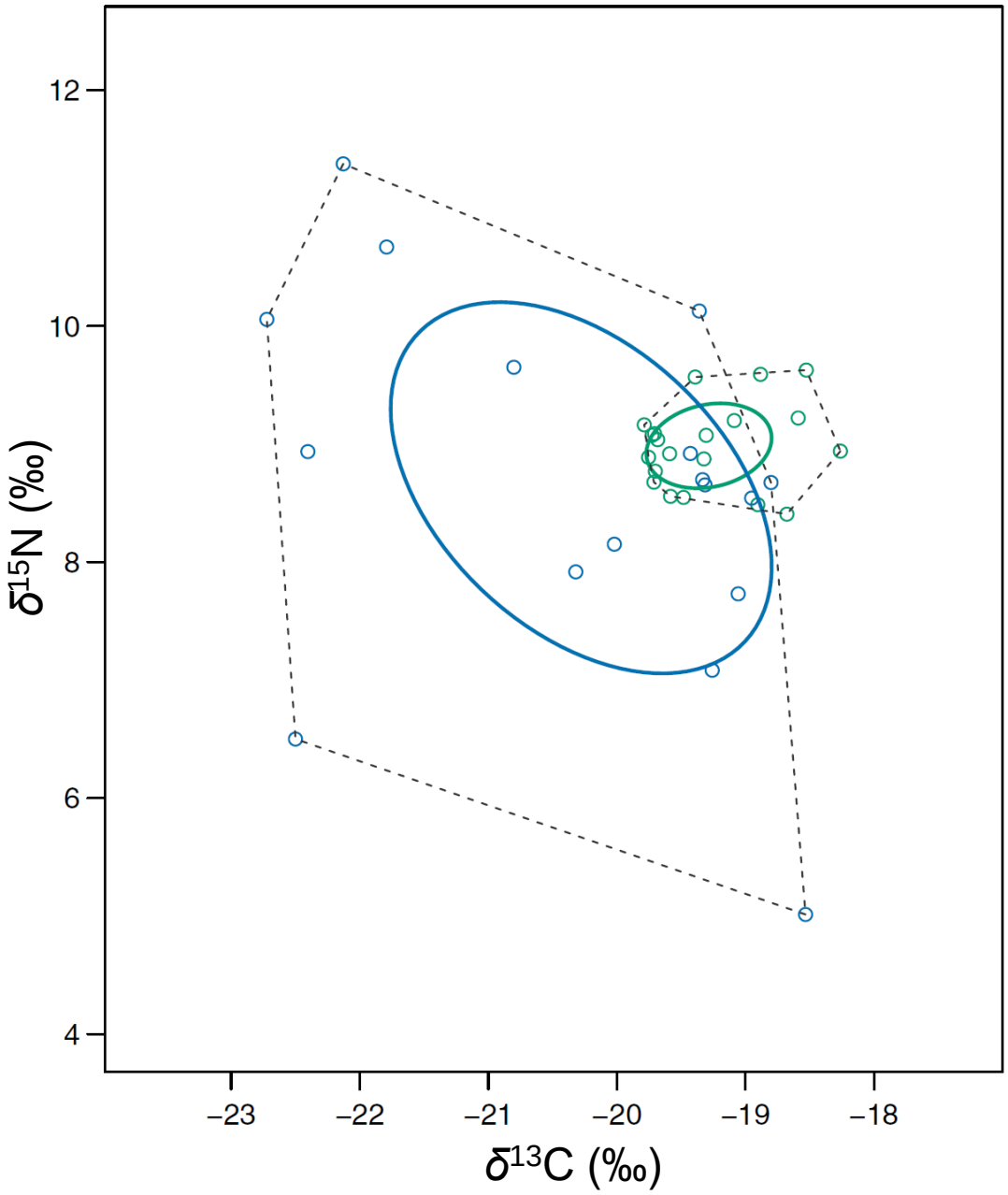

● *Dendronepthya*

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● *Paraplexaura*

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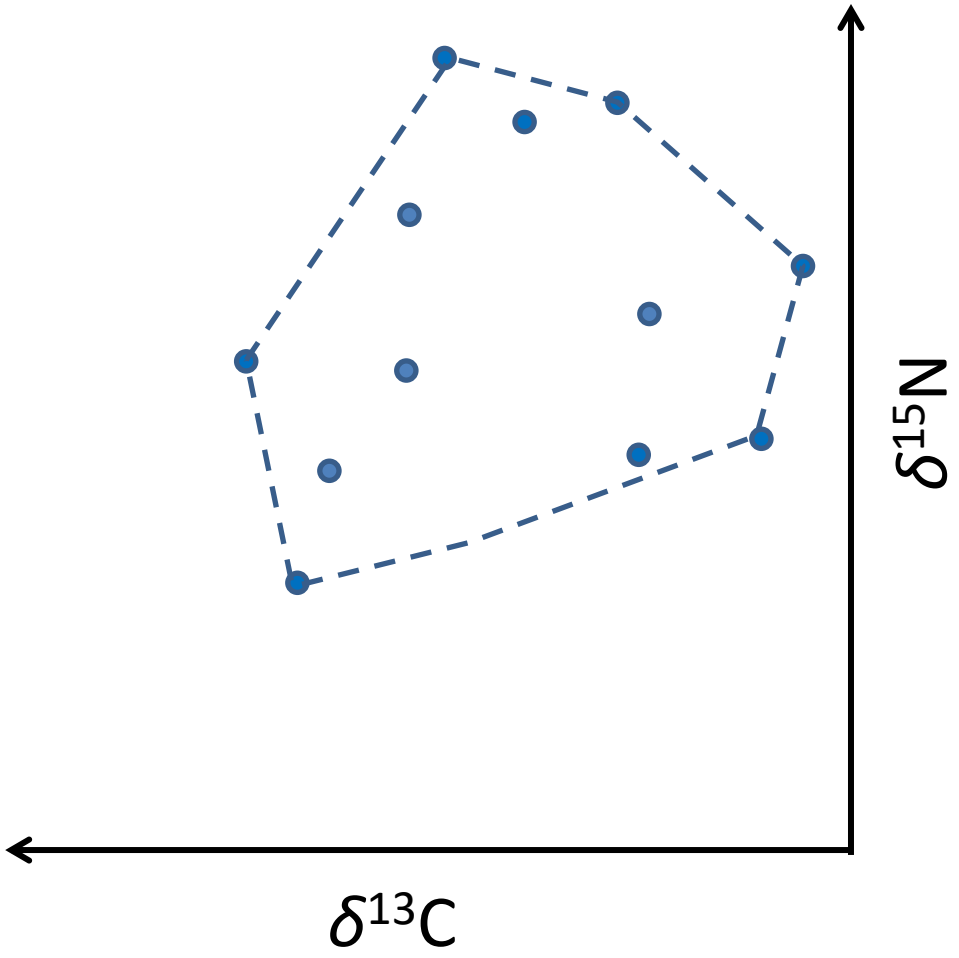

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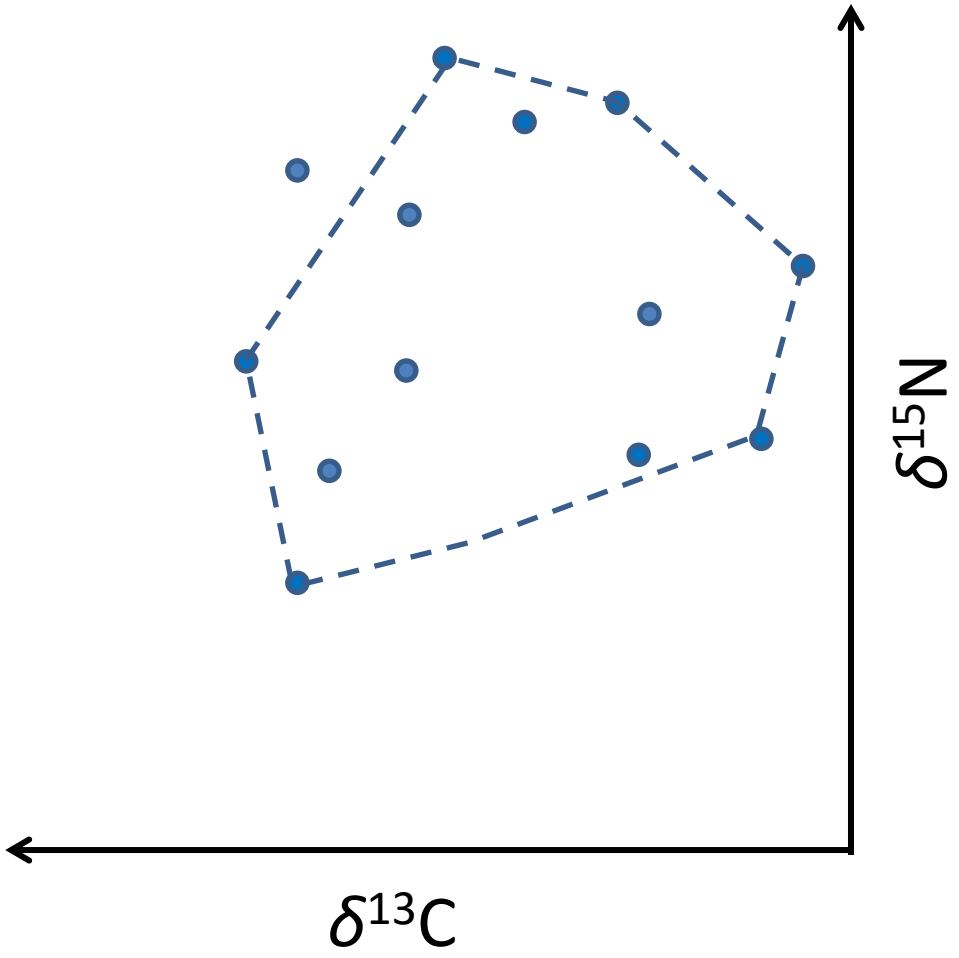

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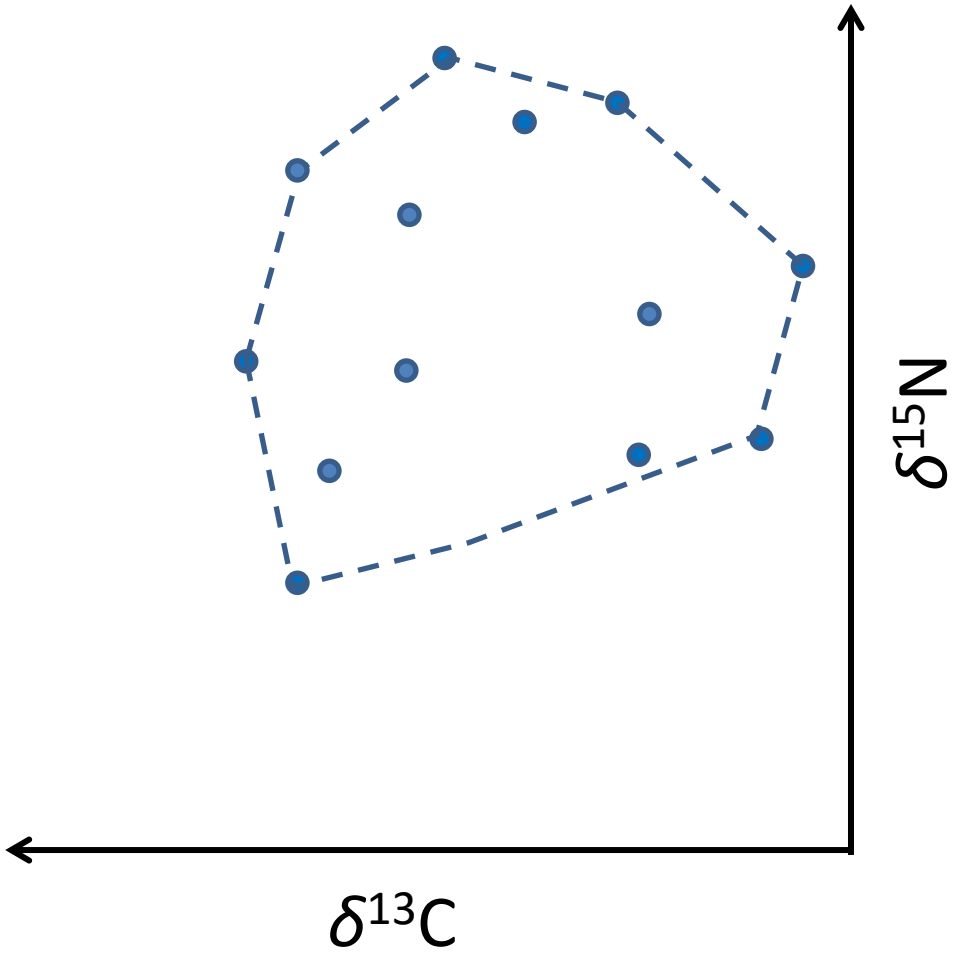

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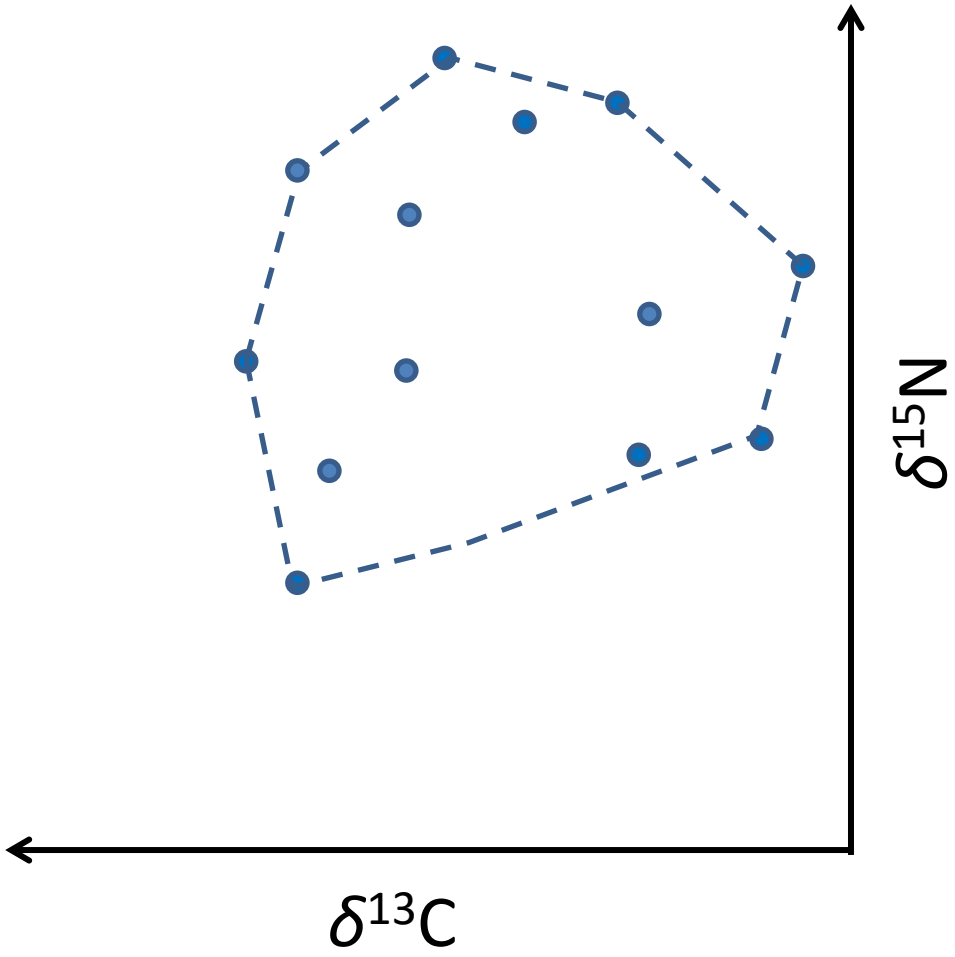

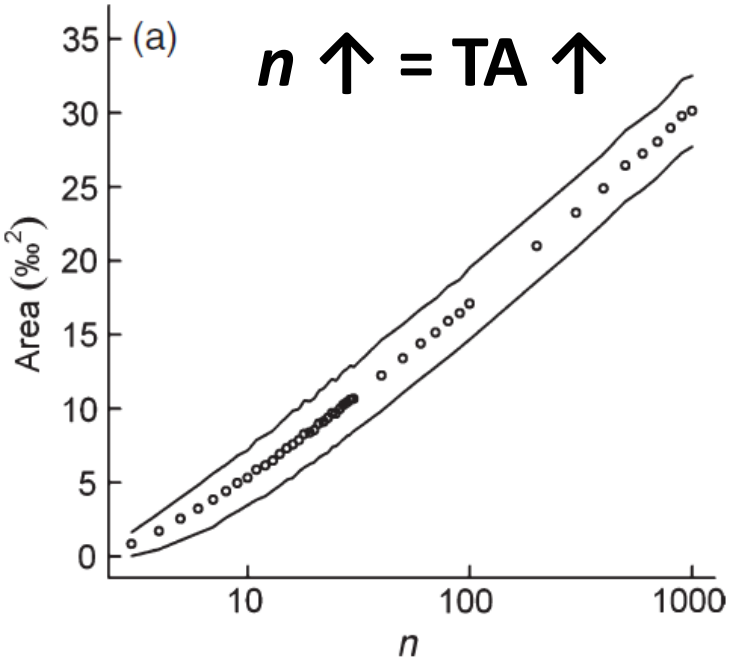

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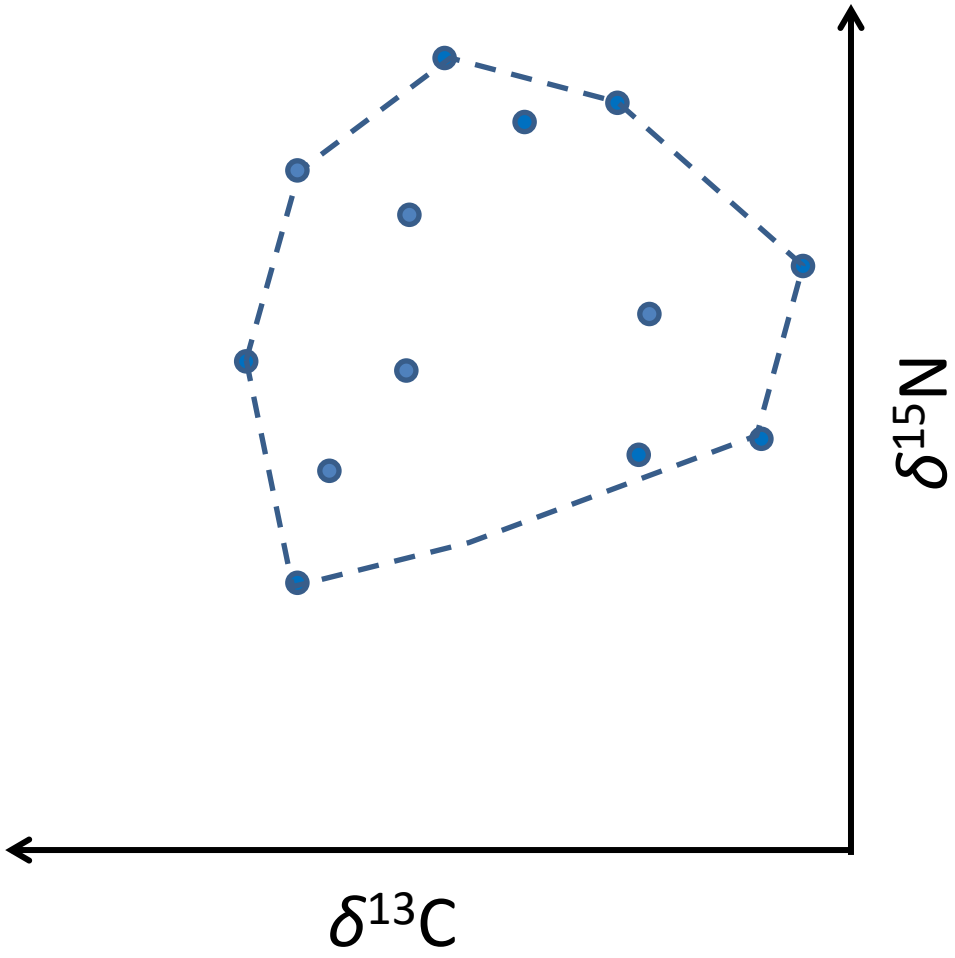

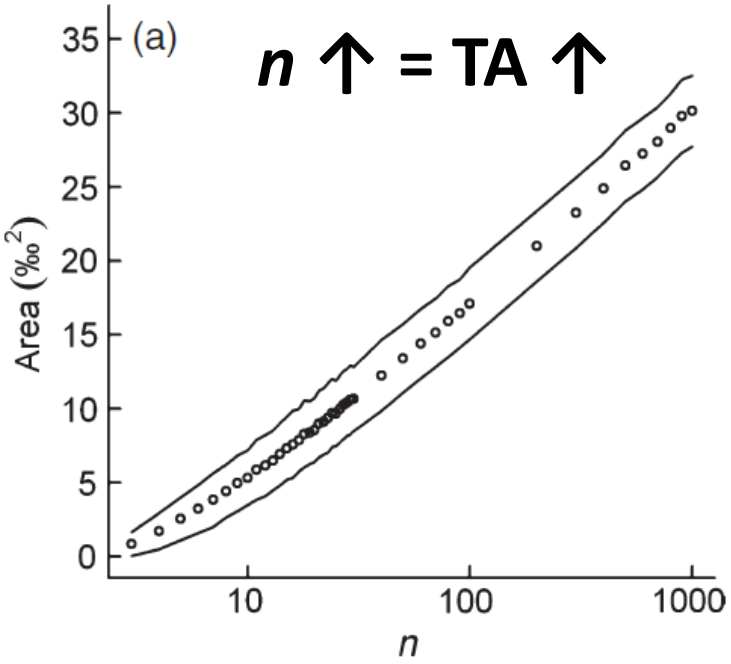

Jackson et al. 2011: Stable Isotope Bayesian Ellipses in R Analysis (SIBER)

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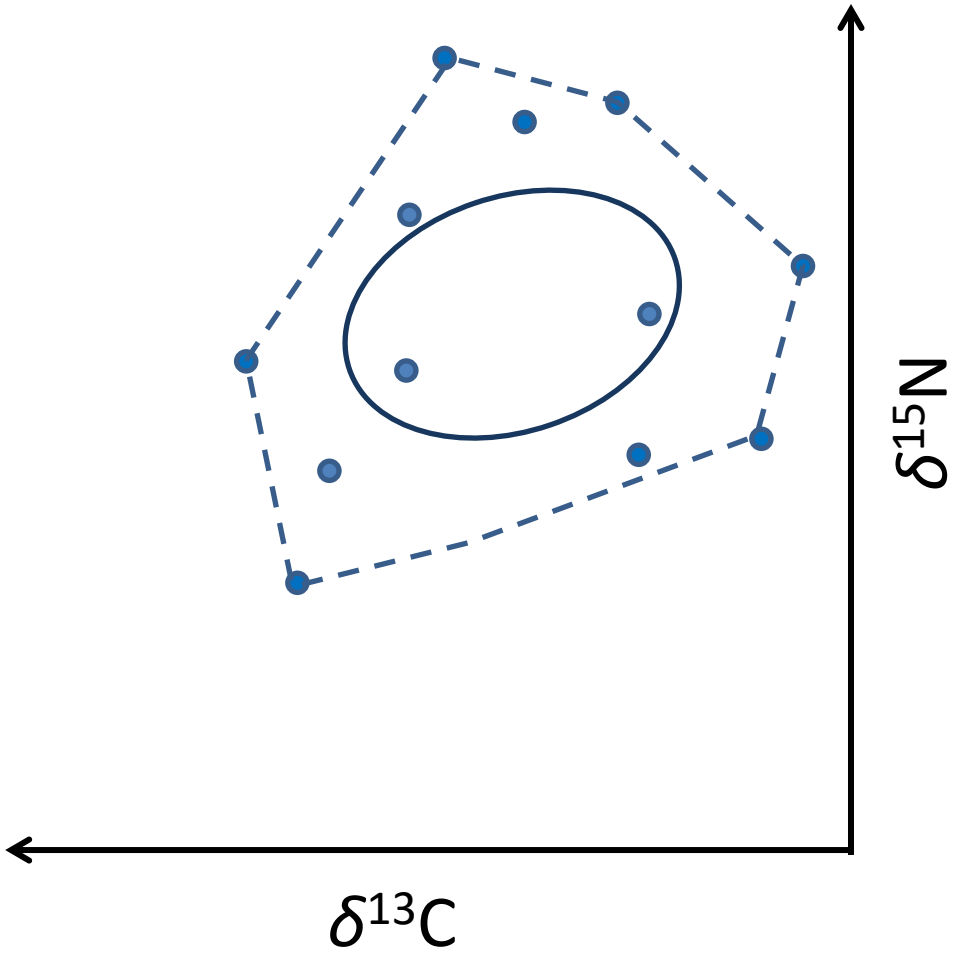

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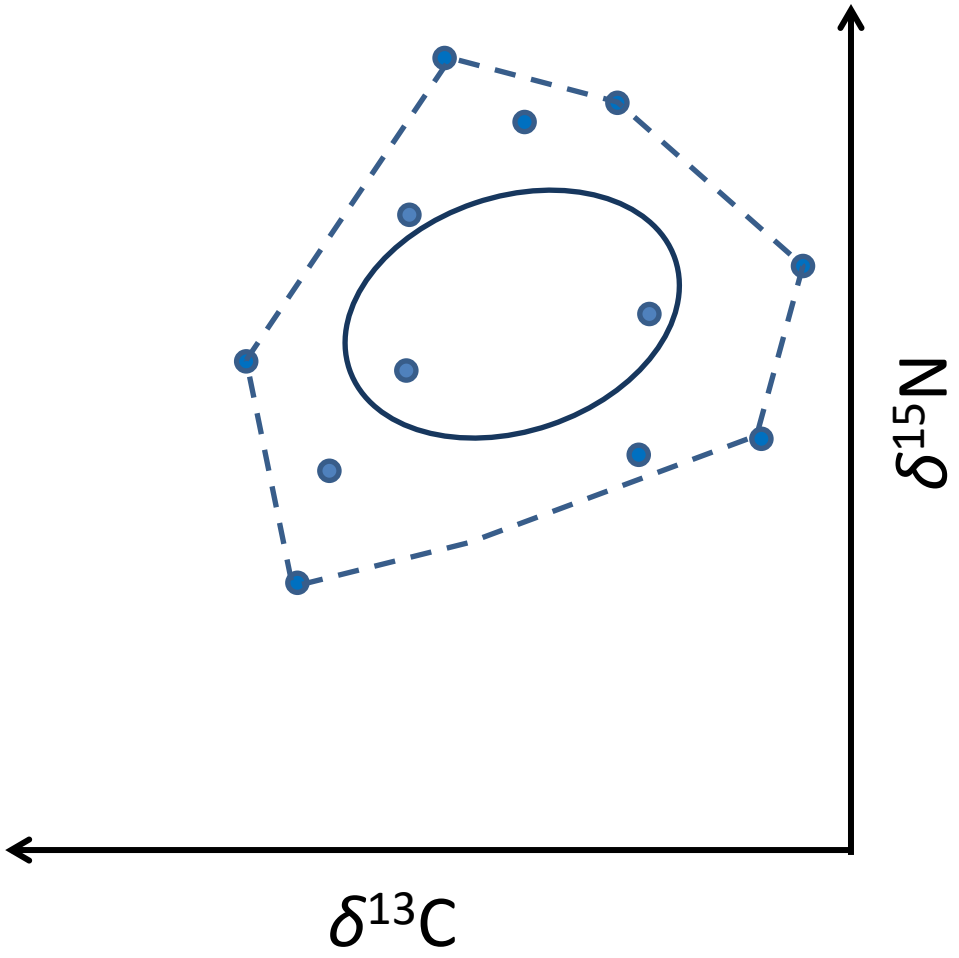

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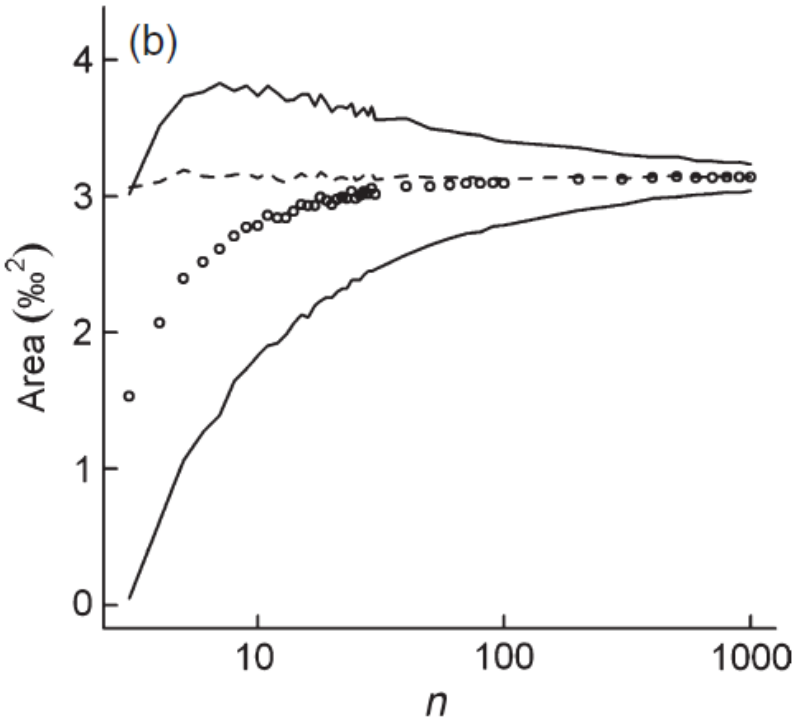

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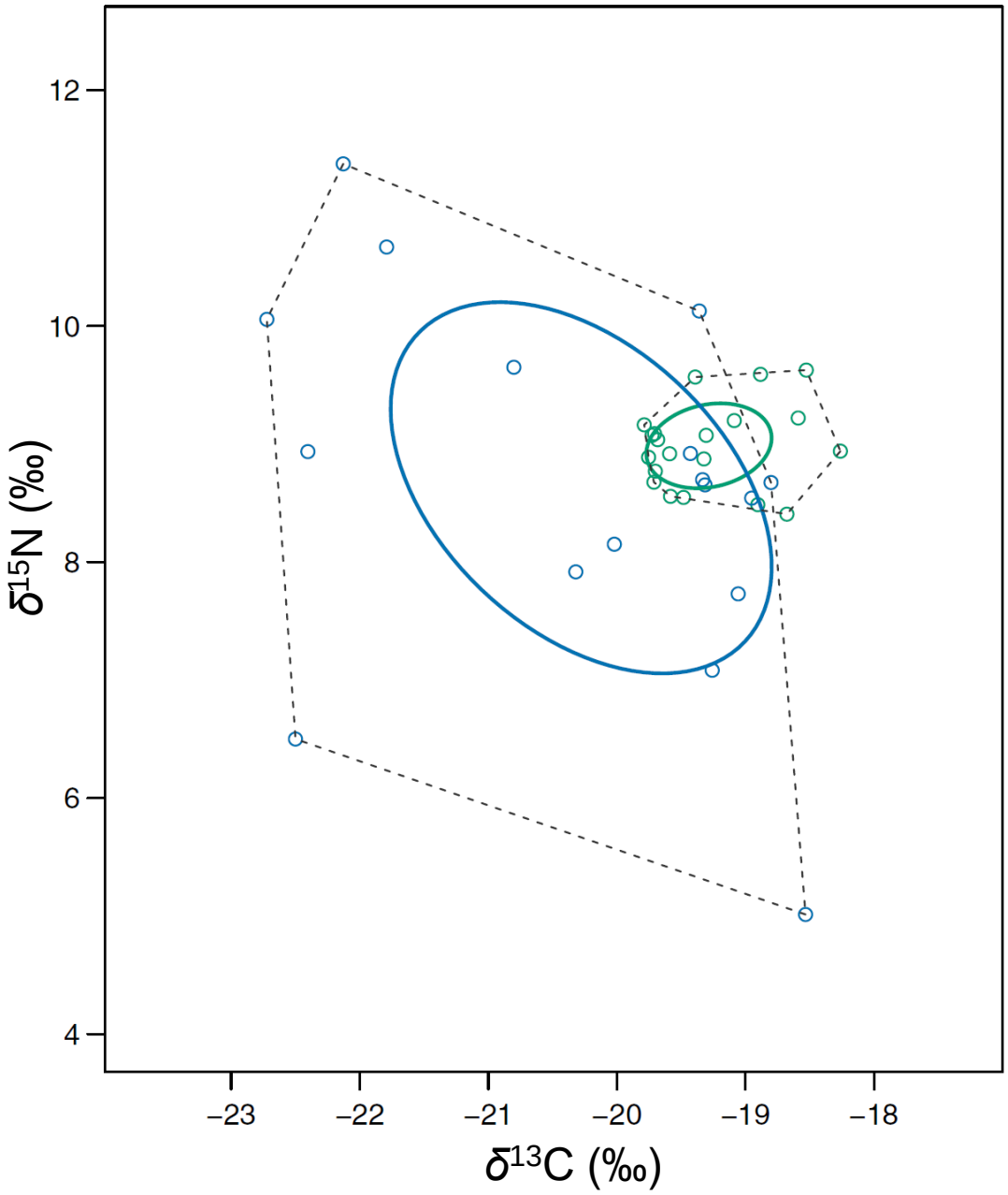

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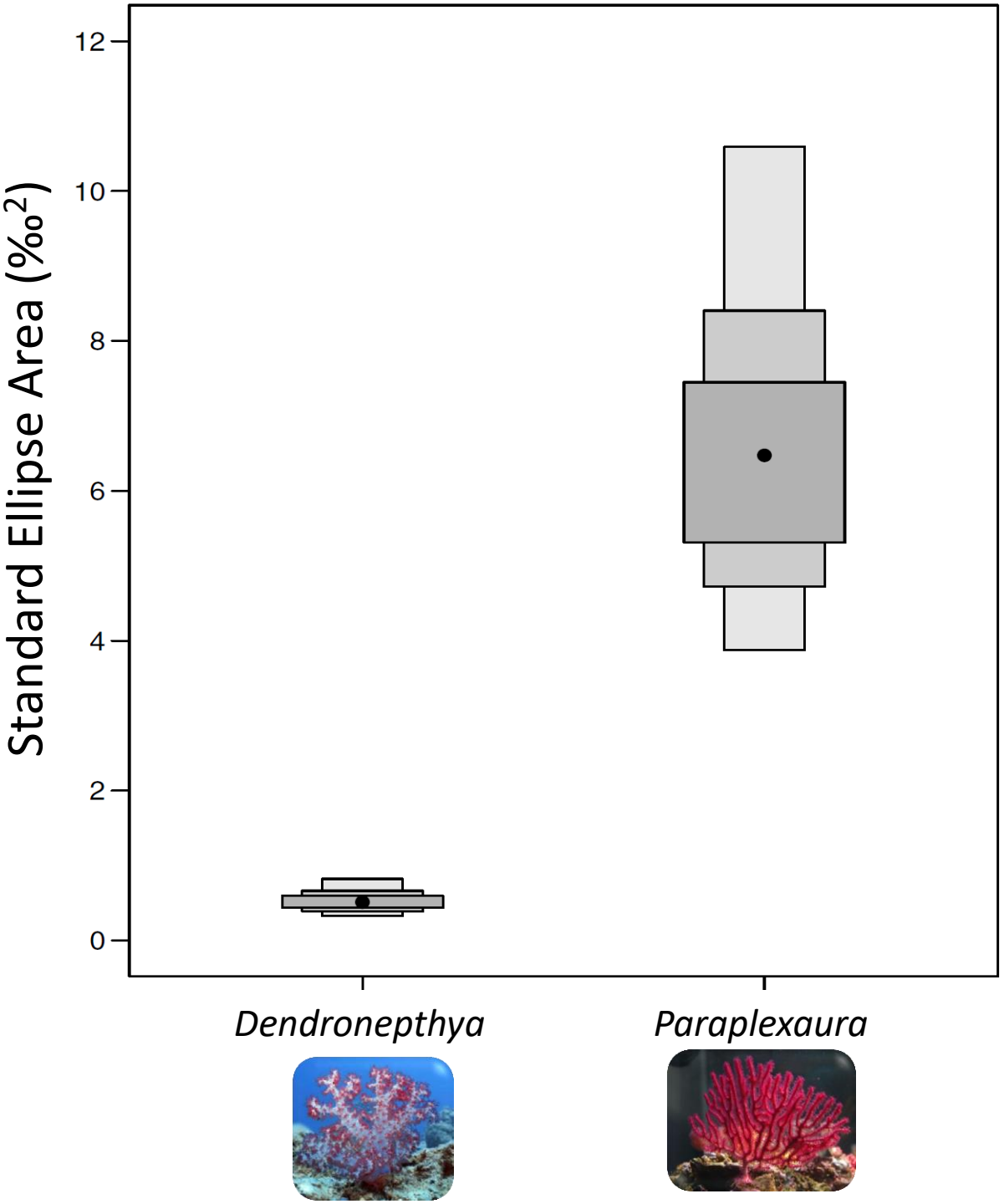
Standard Ellipse Area (‰²)
12
10
8
6
4
2
0
Dendronepthya
Paraplexaura

Considerations and Limitations

- **Sample size**

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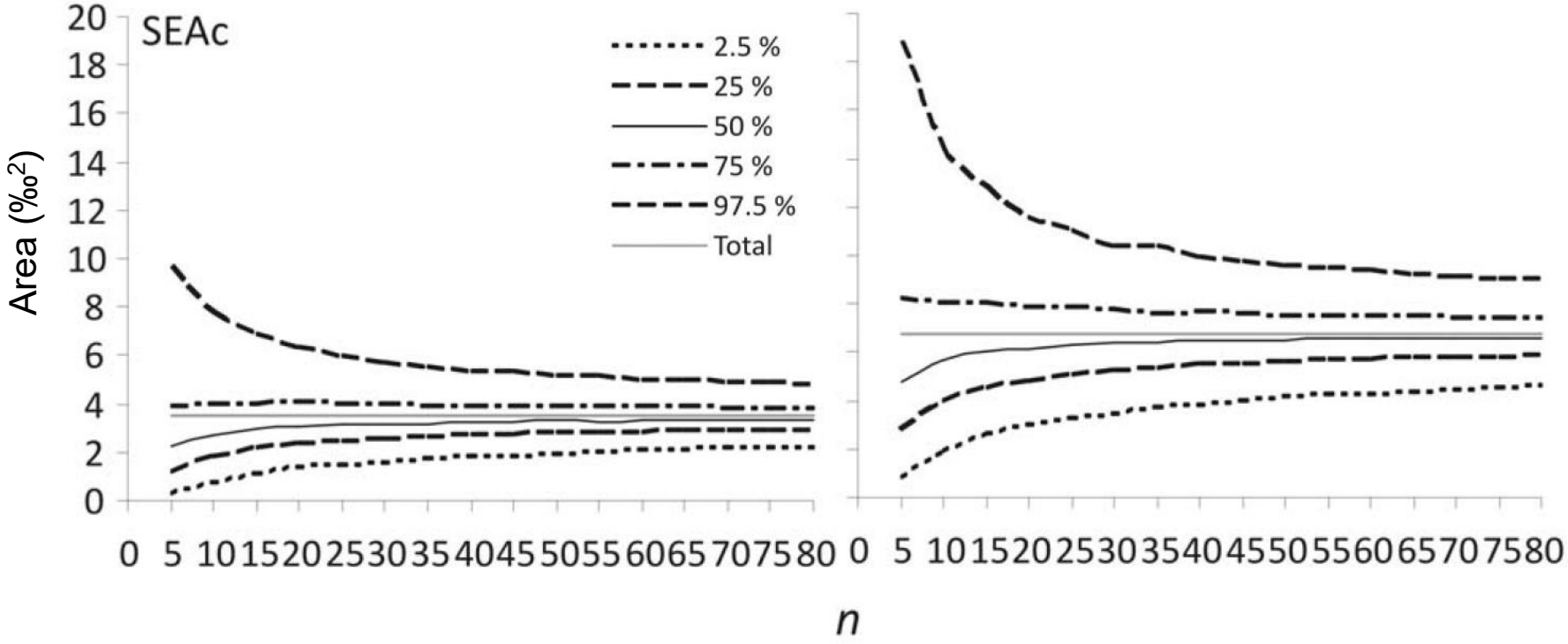
Syväranta et al. 2013



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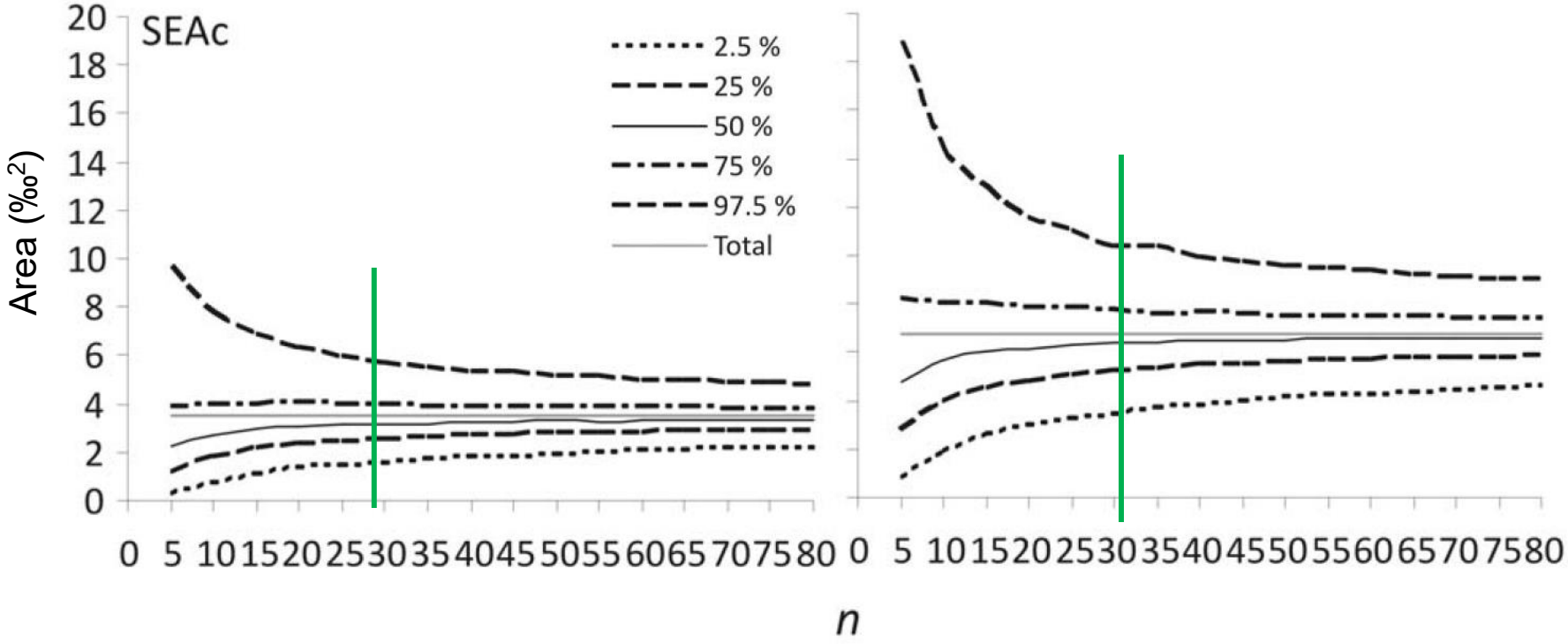
Syväranta et al. 2013: $n \geq 30$



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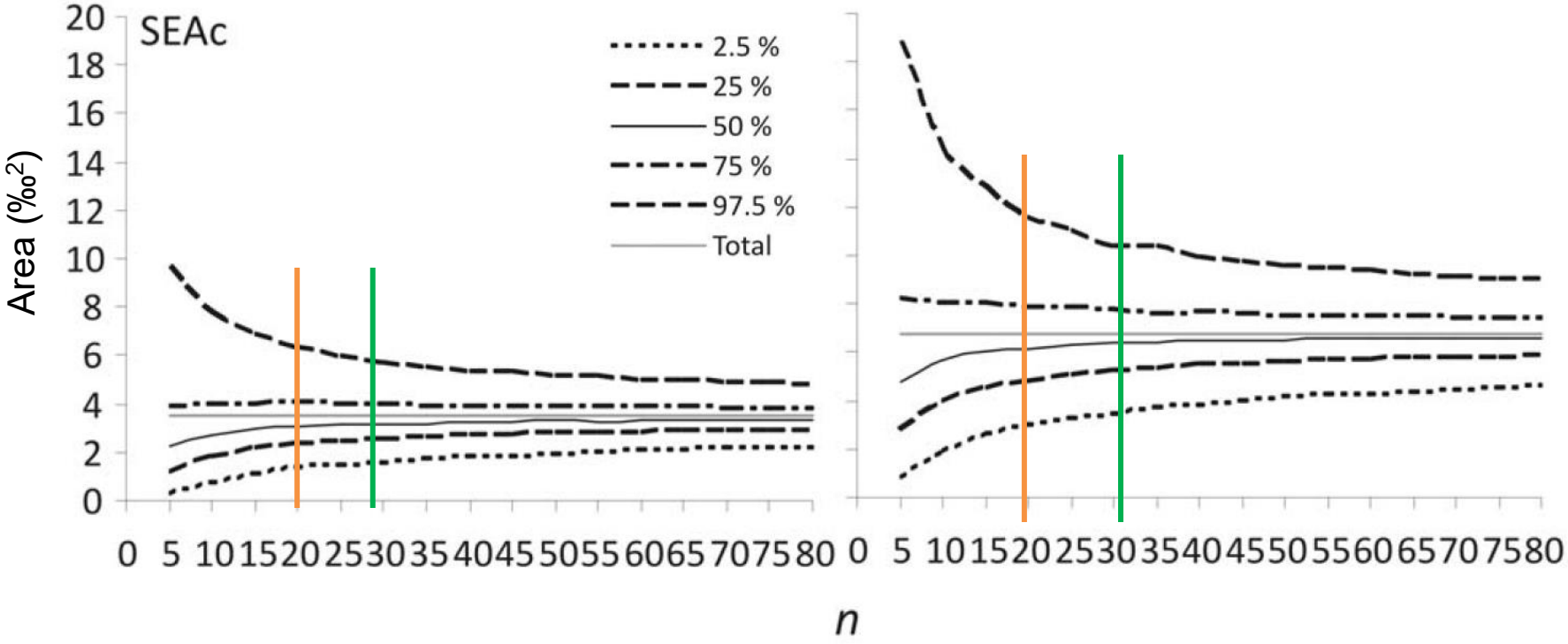

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- **Sample size**; $n \geq 30$
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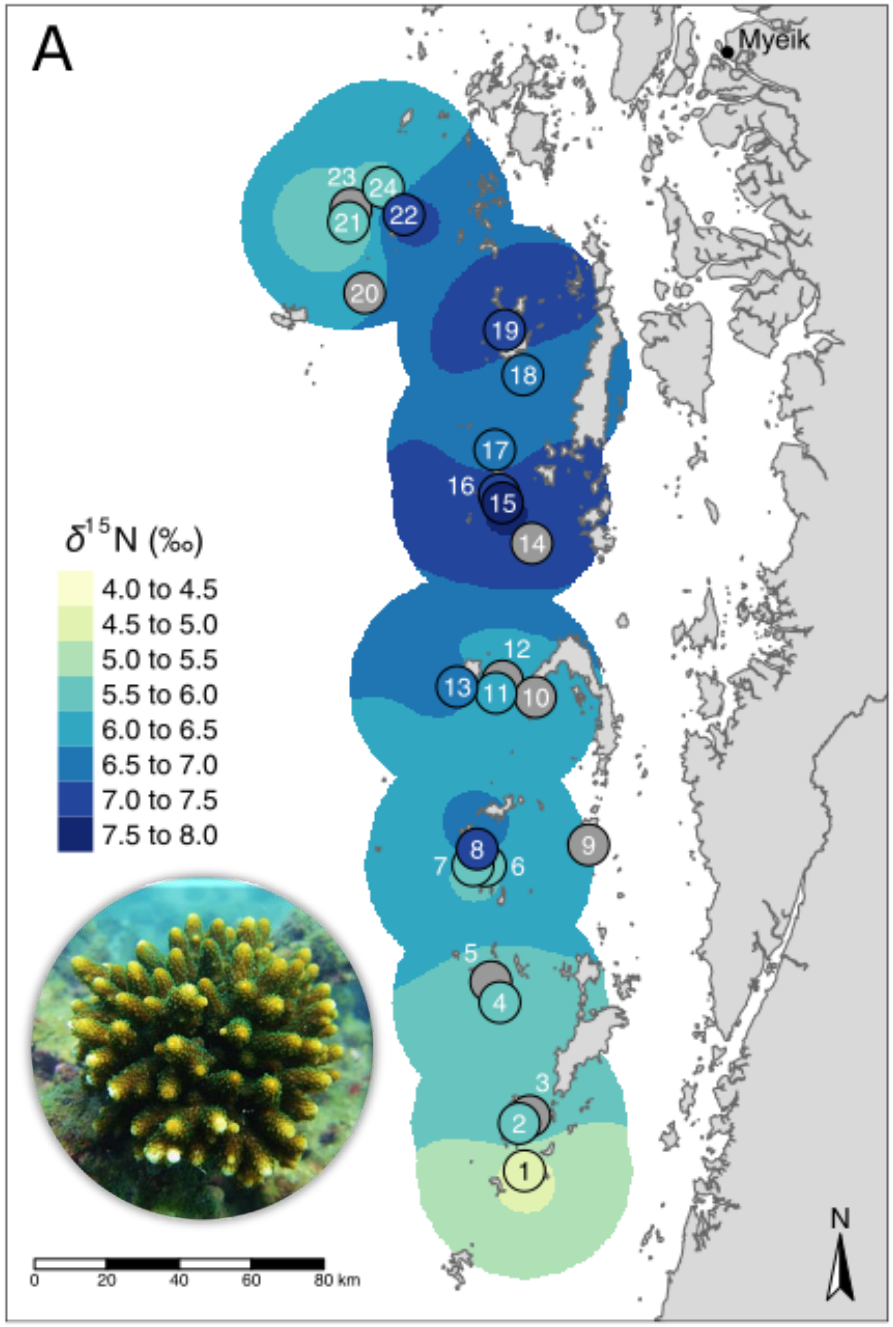
  - Spatial
  - Temporal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δ15N (‰)
4.0 to 4.5
4.5 to 5.0
5.0 to 5.5
5.5 to 6.0
6.0 to 6.5
6.5 to 7.0
7.0 to 7.5
7.5 to 8.0
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80 km
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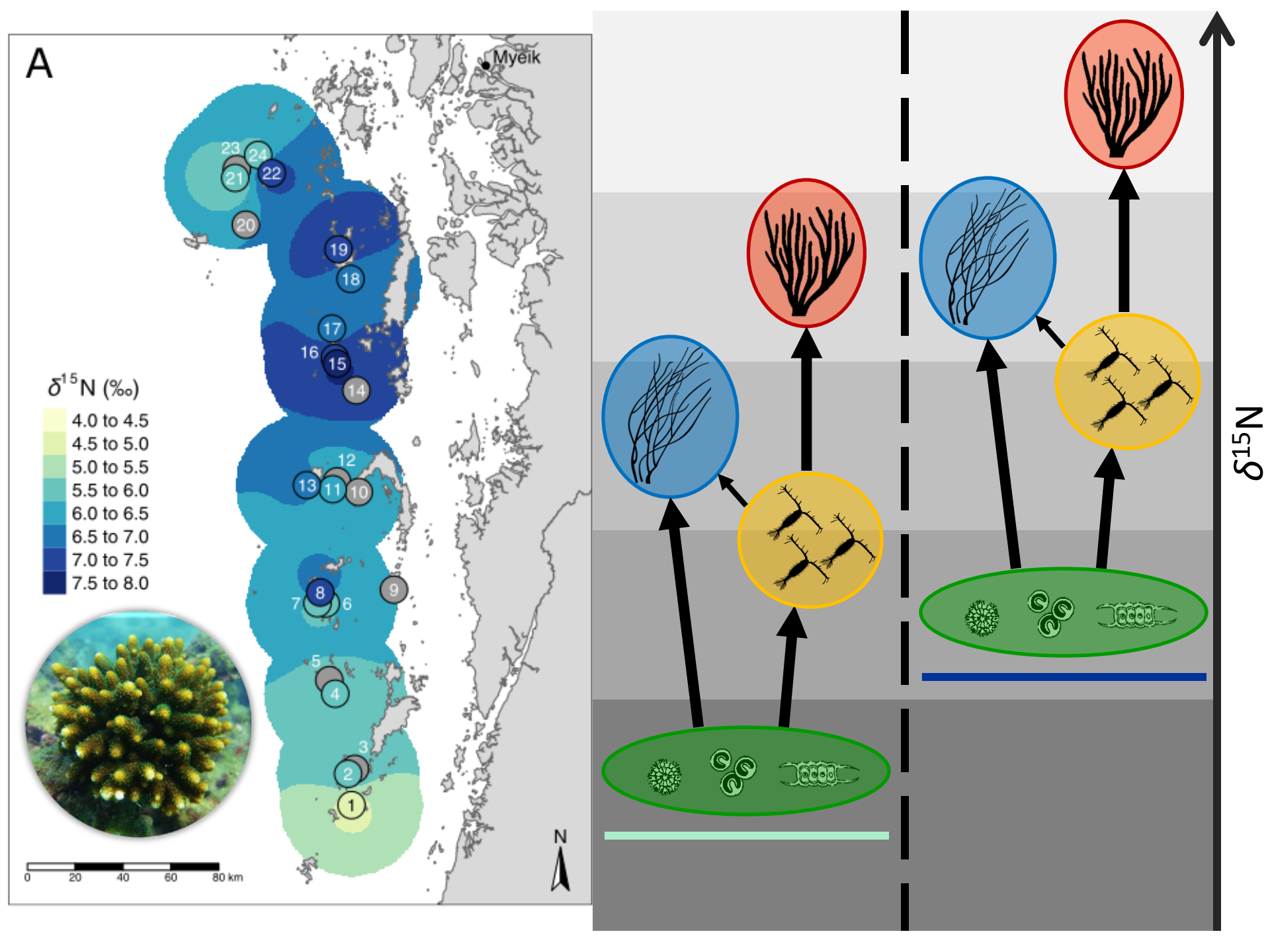
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δ15N (‰)
4.0 to 4.5
4.5 to 5.0
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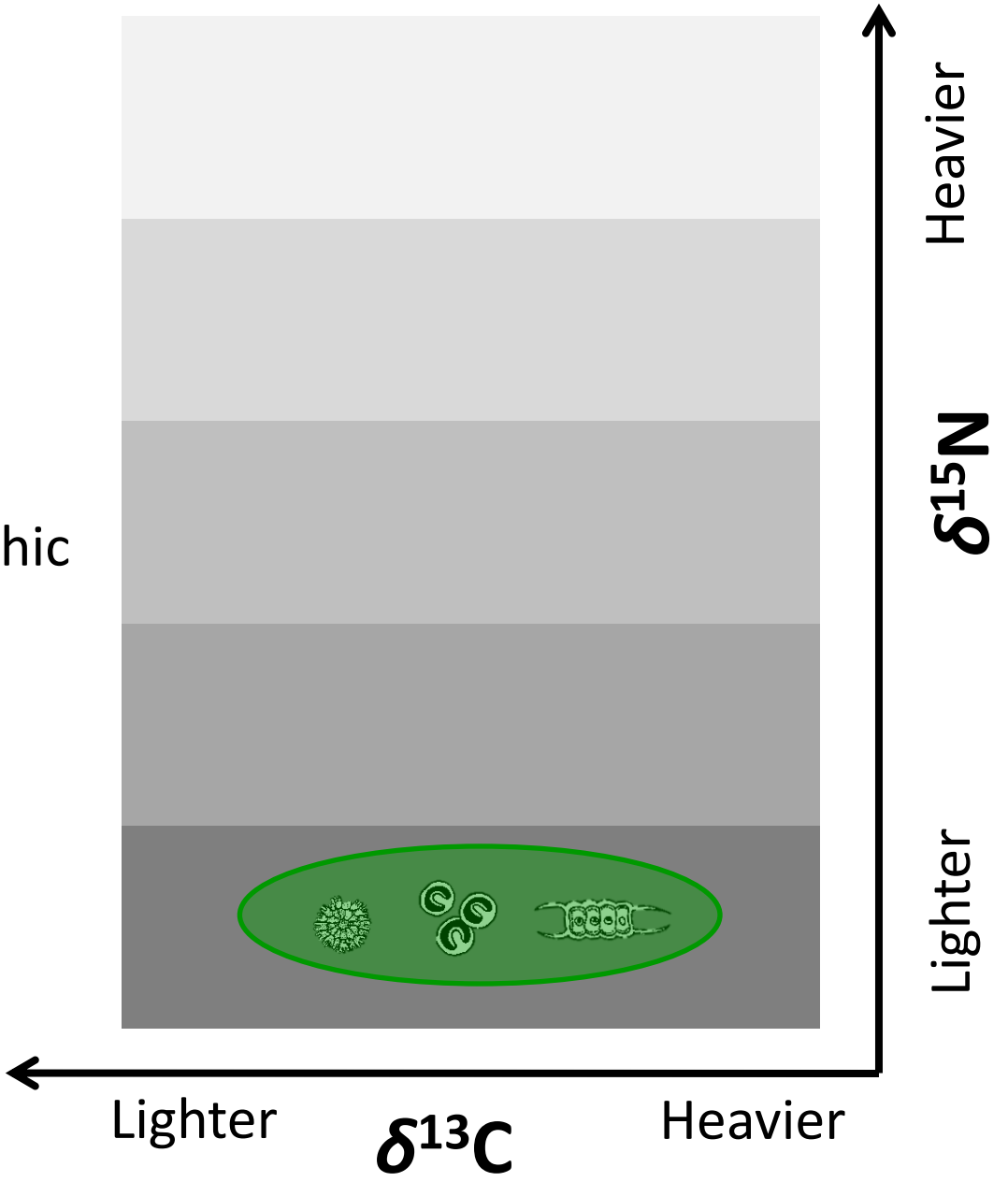

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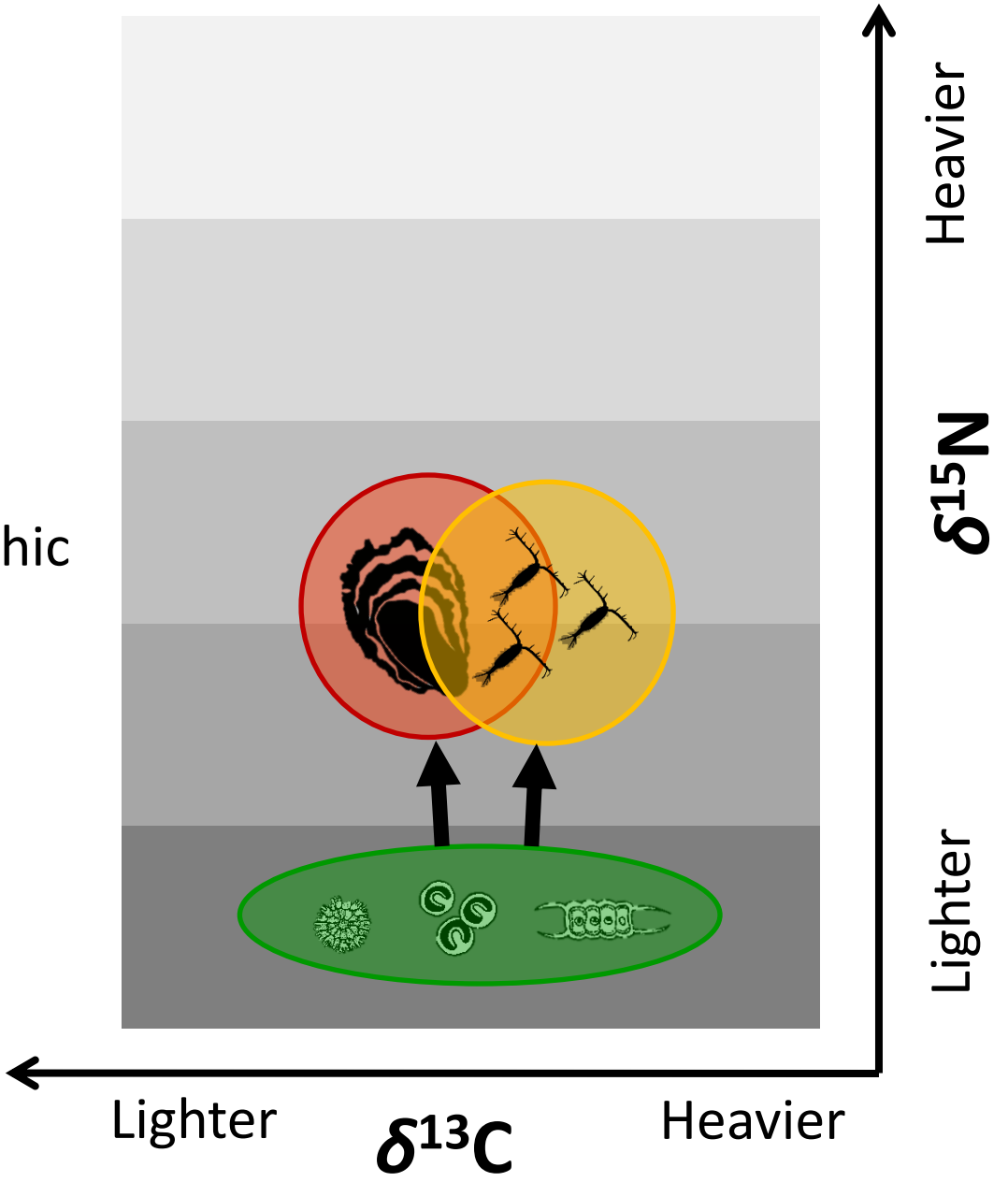

Considerations and Limitations

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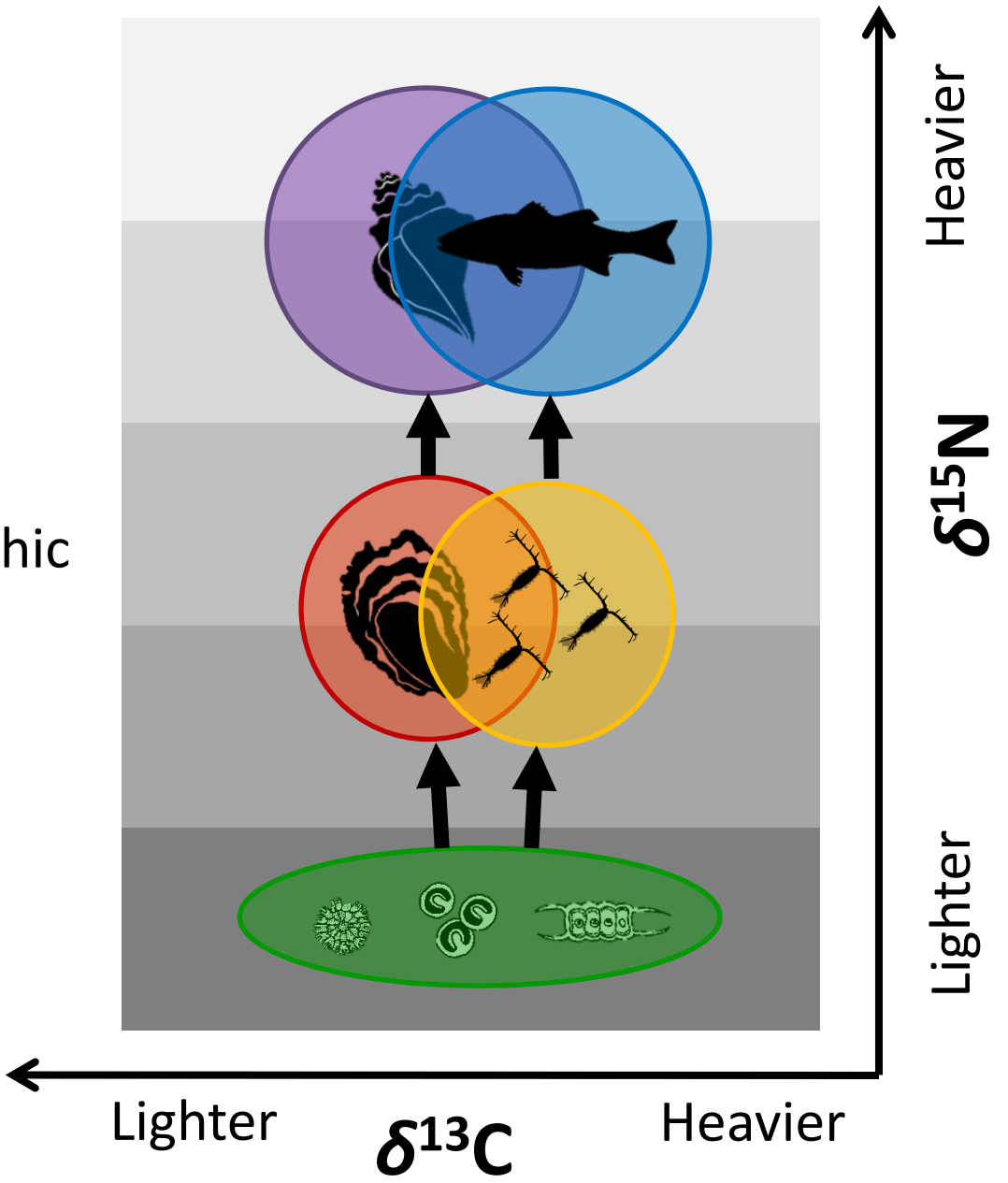

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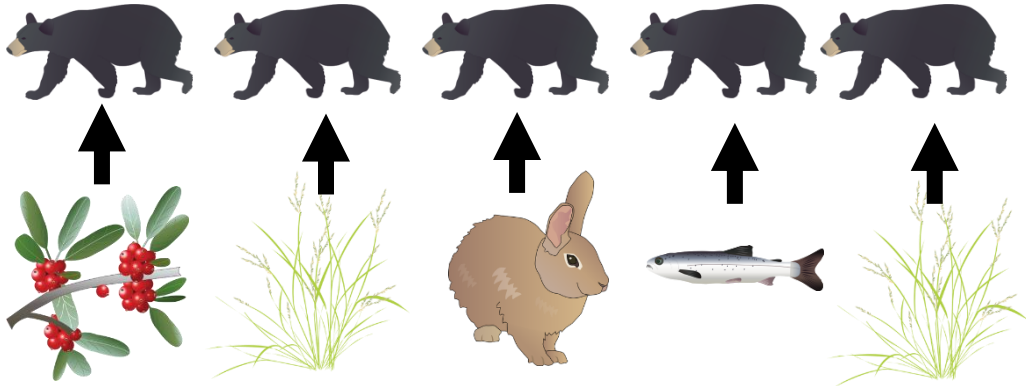

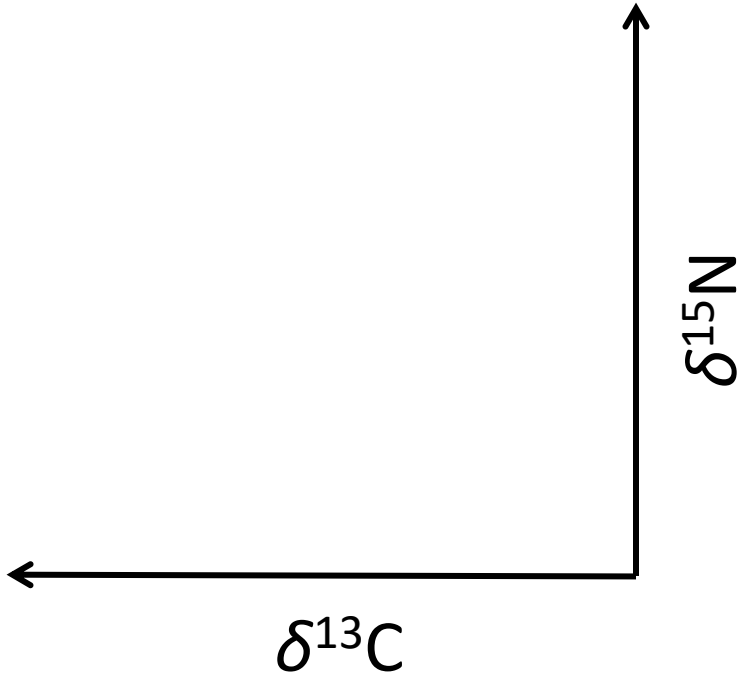

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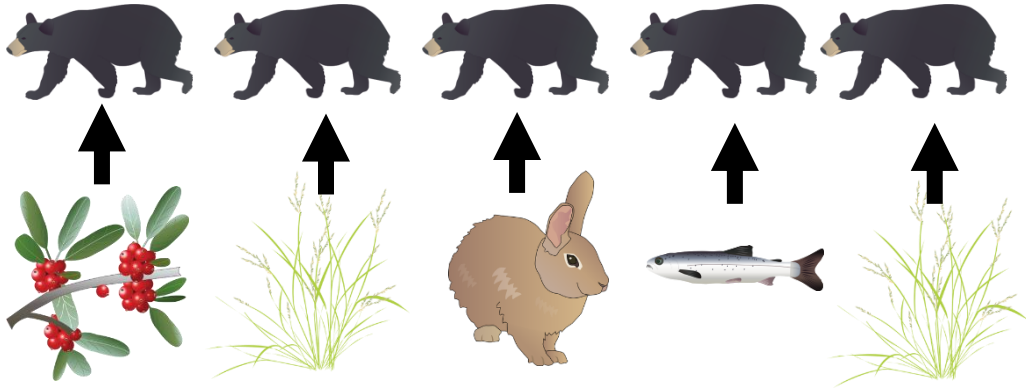

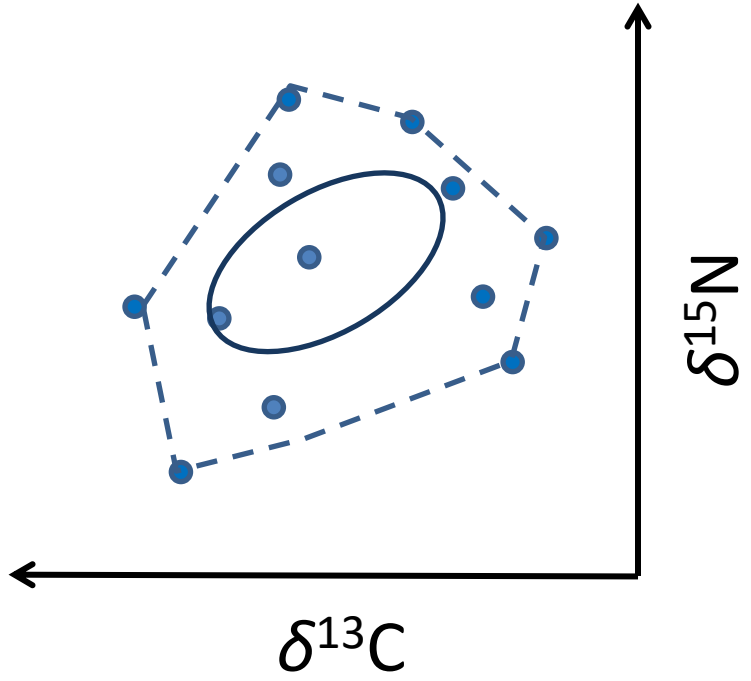

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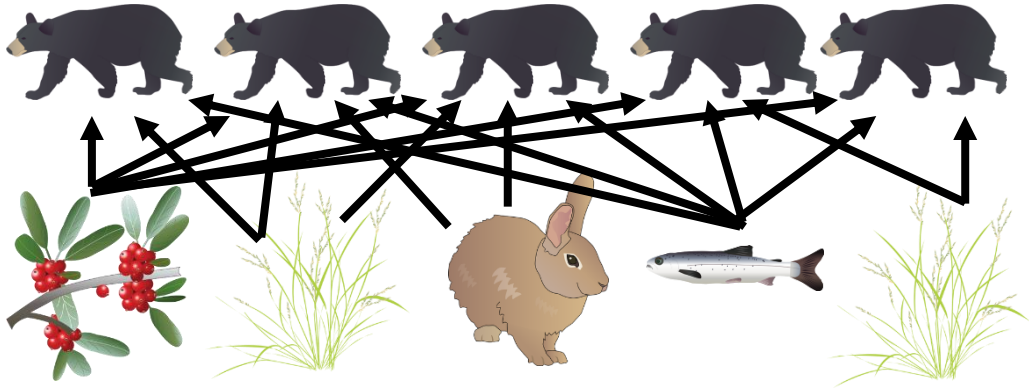

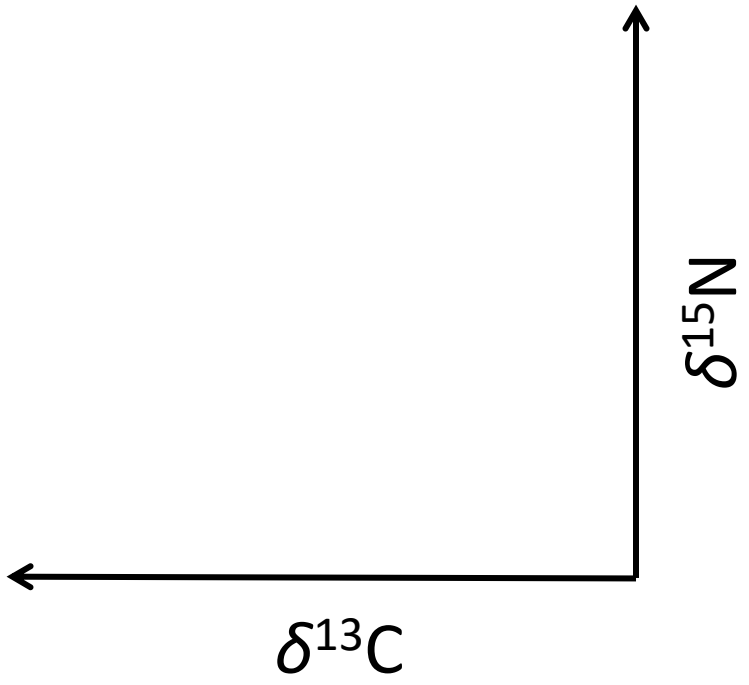

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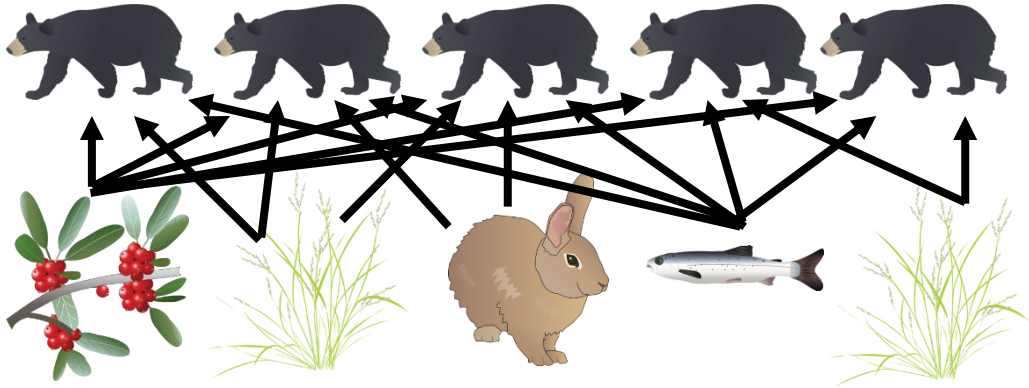

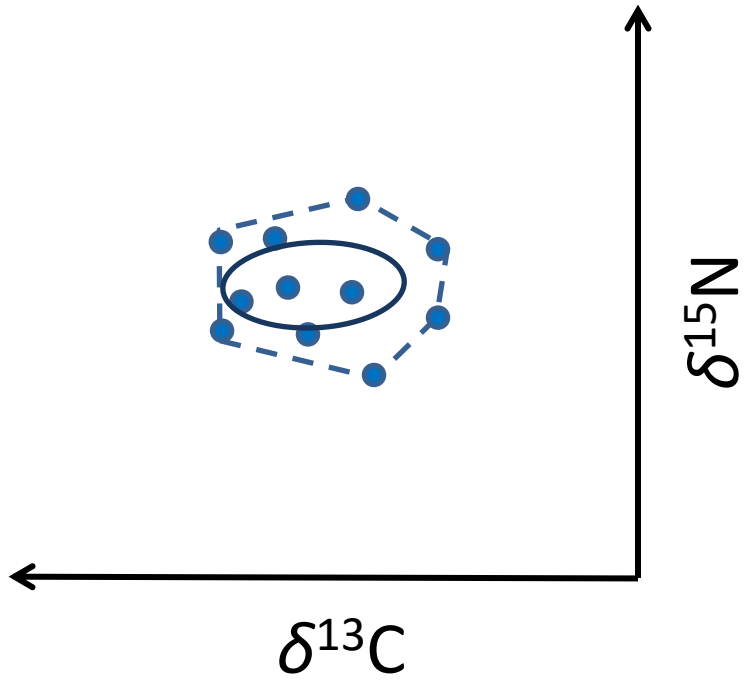

If statistics programs/languages were cars...

Resources

- **Layman Metrics**
  - Layman, C.A., Arrington, D.A., Montaña, C.G., Post, D.M. 2007. Can stable isotope ratios provide for community-wide measures of trophic structure? *Ecology* 88: 42-48.
  - Turner, T.F., Collyer, M.L., Krabbenhoft, T.J. 2010. A general hypothesis-testing framework for stable isotope ratios in ecological studies. *Ecology* 91: 2227-2233.
    - Example R script: *Ecological Archives* E091-157-S1
- **SIBER**
  - Jackson, A.L., Inger, R., Parnell, A.C., Bearhop, S. 2011. Comparing isotopic niche widths among and within communities: SIBER – Stable Isotope Bayesian Ellipses in R. *Journal of Animal Ecology* 80: 595-602.
  - SIBER Package summary
  - SIBER Github
    - Intro to SIBER
  - Jackson's podcasts (videos)
  - Syväranta, J., Lensu, A. Marjomäki, T.J., Okasenen, S., and Jones, R.I. 2013. An empirical evaluation of the utility of convex hull and standard ellipse areas for assessing population niche widths from stable isotope data. *PLOS ONE* 8: 1-8.